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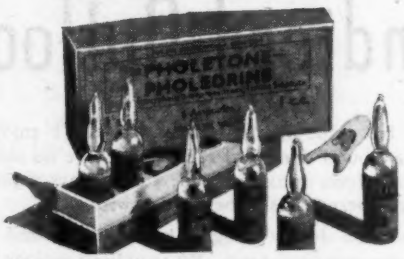

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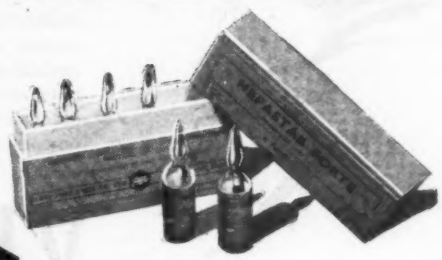

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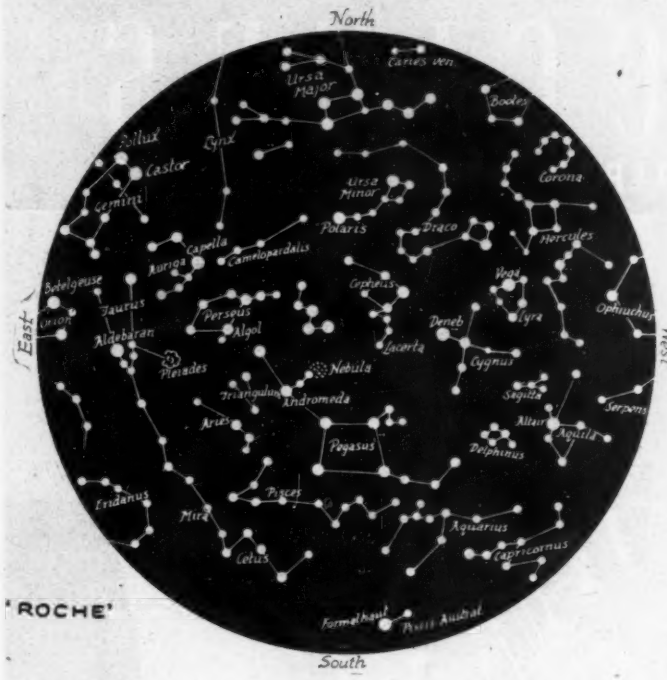
ASTRONOMICAL CHART (*Northern Hemisphere*)



OCTOBER

The Moon

The moon's first quarter is on October 6th, full moon October 13th. In the early morning of October 18th the moon is close to Mars. The last quarter is on the 21st and the moon passes close to the south of Jupiter on the morning of the 23rd. New moon appears on October 29th.

The Planets

The major planets are all morning stars throughout October. Mercury reaches its greatest western elongation of 18° on October 10th, when it rises 1½ hours before the sun. Venus is conspicuous in the morning sky, reaching its greatest brilliance on the 13th, when it is about 130 times the brightness of a star of the first magnitude. Mars moves slowly eastward in Taurus. Jupiter also moves eastward west of the "sickle" of Leo.

The chart shows the brighter stars above the horizon in the latitude of London at 11 p.m. at the beginning of the month and 9 p.m. at the end (G.M.T.).

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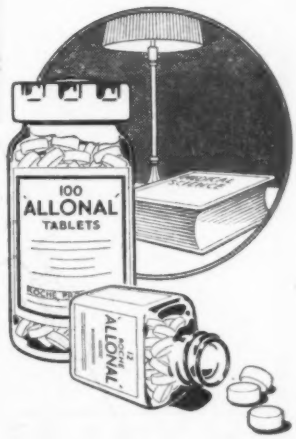

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LIMB COMPRESSION IN THE TUBE SHELTER DISASTER

E. G. L. BYWATERS, M B LOND, M R C P
BEIT MEMORIAL RESEARCH FELLOW; ASSISTANT IN THE DEPARTMENT OF MEDICINE, BRITISH POSTGRADUATE MEDICAL SCHOOL

With a note on PLASMA VOLUME DETERMINATIONS

A. C. CROOKE, M D CAMB
C. J. O. R. MORRIS, PH D, M SC LOND

DEPARTMENT OF MEDICINE, A LONDON HOSPITAL

AMONG the 60 injured survivors of the shelter disaster on March 3, 1943, in which over 200 people were tightly packed for 1½–2 hours, 12 cases were seen showing signs of muscle damage similar to those of the crush syndrome. The cases were of all degrees of severity, ranging from case 1 who died of injuries other than those to muscle within an hour of release, and case 2 who developed severe uræmia, to patients whose injuries were skin deep only. While only the more severe injuries were of clinical importance, the slighter cases, which by themselves could not be said to have been suffering from "crush syndrome," illustrated the response to a milder degree of the same injury; there may have been others of this mild type which escaped notice. It was not possible to follow all of these 12 cases thoroughly, but some observations of value to the problem of crush injury have emerged.

CASE 1

Male, aged 18, admitted to hospital at 11.05 PM, 2½ hours after he was trapped. He was conscious on arrival and "shocked"—cold, shivering, with a weak pulse and shallow respirations. Muscles of the thigh and arm were swollen but hard and firm. Within 45 min. of admission he was found in a "fit," vomiting and unconscious, with gasping respiration. He was still very cold, with a weak and rapid pulse, and died in a few minutes.

Autopsy (Dr. Keith Simpson).—Strong physique; no disease bearing on cause of death. Particularly heavy and sustained pinning pressure evident across left side of trunk; heaviest across left thigh. Heavy clothing pressure marks extended from left mid-chest across left abdomen to left forearm and upper leg; deep asphyxial congestion with many petechial hæmorrhages over head and neck (gross bleeding from right ear and shoulder). Direct pressure abrasions present on left brow and right upper and lower lips, the latter crushed and bleeding slightly.

Evidence of the weight of pressure on the left trunk was given principally by the stomach and intestines, which had already developed traumatic paralytic dilatations. Stomach measured 10 × 5½ in. and contained only 2–3 oz. of fluid and gas. No bony injury was present, but there were gross asphyxial changes with intrapulmonary, myocardial, skin and cerebral hæmorrhages. Remarkable ischæmic necroses of muscle were present in both thigh flexor groups. They were clearly pressure necroses and identical with those seen in persons pinned down by beams and debris in air-raids, and regarded as the basis for myohæmoglobinuria and subsequent suppression of urine. He must have remained alive while pinned down and for a time after release for this condition to appear in the muscle. It is unlikely that sufficient time elapsed for renal changes to appear. In view of the other findings this condition could have no bearing on the cause of death, which was pulmonary and cerebral hæmorrhage due to asphyxia (from suffocation).

Histological examination showed in the muscle some slight œdema with areas of commencing degenerative change, hyaline and vacuolar degeneration and nuclear pyknosis. The kidneys showed little change, except in Bowman's capsule, which contained eosinophil granular material; the first portion of the proximal convoluted tubule pouted into the capsule. The capillaries were congested.

It may be concluded from this case that muscle degeneration may follow compression for two hours without any violent "crush" such as occurs when large blocks of masonry fall during air-raids. It also shows that survival for an hour after release is sufficient for plasma to leak out into the muscle, but insufficient, if "shock" is present, for gross or histological renal damage to be seen.

CASE 2

Female, aged 16, admitted to a local hospital after her release (March 3), and transferred to another hospital next day, had been pinned down at the bottom of the steps for 2–3 hours with only her face and right arm free. Before her transfer it was noted that the left calf and right buttock were swollen and tender. On the day after injury she was incontinent and vomiting; there were some abrasions and discoloration with swelling of the left thigh and lower part of both legs. Pulsation was felt in the posterior tibial and popliteal arteries. Reflexes normal. On the 2nd day the urine was acid and dark brown or black ("navy-blue by reflected light") but without sediment. On the 3rd day the urine was less dark (smoky) but only became quite clear of blood by the 7th day; it was never red. She continued to vomit small quantities of bile-stained fluid, but despite occasional slight epigastric pain there was no distension of the abdomen, no "splashing" and no rigidity; there was no rise in temperature. On March 16 (13 days after injury) the intake by mouth was 108 oz. and the urinary output 75 oz. March 17: intake 88 oz., output 65 oz., BP 145/80 mm. Hg. Biochemical details are given in table I.

Examination on March 18 showed a girl with rather thick speech due to a swollen, dry and rather raw tongue covered with brown fur. A systolic murmur was heard at the apex; apex-beat 10 cm. from midline. Fundi normal, chest normal,

TABLE I—BLOOD AND URINE ANALYSIS * IN CASE 2

Date	Days after accident	Blood (per 100 ml.)			Urine (per 100 c.cm.)	
		Hb. (g.)	Urea (mg.)	CO_2cp ‡ (ml.)	Urea (g.)	Protein (mg.)
March 17	14	9·5	380	56	0·97	30
„ 18†	15	9·2	248	54	1·10	30
„ 21	18	..	..	..	1·18	30
„ 22	19	..	..	..	12·8	40
„ 29	26	..	120	..	..	..
April 9	37	..	30	..	..	..

* Methods as listed in Bywaters and Popjak (1942).
† Serum potassium 19 mg., serum phosphate 15·9 mg., serum chloride 560 mg., per 100 c.cm.
‡ Carbon-dioxide combining power.

no enlarged glands. Abdomen soft, no erythema. BP 130/65 mm. Hg. The left arm showed some fading erythematous patches; these were also noticeable over the front of the lower parts of both legs and the front of the left thigh. There was slight residual swelling of the left thigh (circumference 47·5 cm. at 20 cm. and 38·7 cm. at 10 cm. above the top of the patella, compared with 45·5 and 37 cm. in the normal right thigh. This was more apparent to the eye, because of flabbiness of the skin on the left; 15 cm. below the top of the patella the calves measured 27 cm. (right) and 28·5 (left). The peroneal muscles felt flabby and there was some œdema of the left ankle. The anterior tibial arteries were pulsating. There was no loss of light touch or sense of position. Power, however, was greatly diminished in both feet; plantar flexion was very weak and extension was lost. The left knee-jerk was weak compared with the right, and the right ankle-jerk weaker than the left. The Van Slyke standard urea clearance was 23% of normal by the 21st day. "Protein" finally disappeared from the urine by the 22nd day, and vomiting ceased by the 29th day. She was discharged on April 11 with a normal blood-urea.

This patient was already recovering by the time it was possible to make a detailed examination. No special treatment had been instituted other than rest in bed and good nursing. There had been severe uræmia, and renal function was still poor, though the urinary area concentration was recovering at a rate of 50–100 mg. per 100 c.cm. per day. There was also a residual anæmia which is often a feature of crush syndrome.

CASE 3

Female, aged 20, admitted to hospital at 11.25 PM, 3 hours after she was trapped. Her right leg had been compressed and very painful for 1½ hours according to her estimate, but more probably 2–2½ hours. She had passed urine last at 7.30 PM, an hour before the accident. Neither on admission nor subsequently did she appear to be shocked.

Examination at 3.30 PM on March 4 (19 hours after she was trapped) showed a pale young woman with a left subconjunctival hæmorrhage. She had vomited 9 oz. in the past few hours.

Temperature 97° F. pulse-rate 90–100, respirations 28 per min., BP 120/90 mm. Hg. The left leg showed only a few erythematous patches on the shin and over the dorsum of the foot. The right leg, however, was more severely damaged: there was a large erythematous patch, 6 in. × 8 in., on the inner side of the upper thigh, a similar one on the anterior and outer side of the lower thigh, and smaller patches on the lateral and medial anterior surfaces of the shin. No objective sensory loss could be found, but a patchy numbness was complained of over the lower legs. The upper part of the thigh was a little swollen (see table II) and painful: there was

TABLE II (CASE 3)—CIRCUMFERENCE OF LEGS IN INCHES

Site: Top patella	March 4 3.30 PM	March 5 10 AM	March 6 noon	March 8 2 PM	March 12 4 PM
8 in. above	R. 18 L. 17½	17½ 16½	17½ 16	19½ 15½	17 15½
4 in. above	R. 15½ L. 14½	15½ 14½	15½ 14	16½ 13½	14½ 13
6 in. below	R. 12½ L. 12½	12 11½	12½ 11½	12 11½	.. ..

a well-marked swelling and doughy feeling (without pitting) of the lateral quadriceps above the knee, of the whole of the peroneal extensor compartment, which was very hard and of part of the gastrocnemius. Pulsation could not be felt in the posterior tibial artery, and it was diminished compared with the uninjured side in the anterior tibial artery; but the toes were warm. She could not extend her toes at all; weak plantar flexion was just possible. Urine passed at 7.15 AM and 12.30 PM was acid (pH 5·5), dark brown, and spectroscopically showed well-marked bands of myohæmoglobin (at 581 mμ) and metmyohæmoglobin (636 mμ) (see fig. 1); no casts were seen; a white deposit consisted of amorphous granules; no reducing substances were present. Sodium bicarbonate, 8 g. by mouth, was vomited immediately, and therefore an intravenous infusion of a litre of M/6 (isotonic) sodium lactate (containing 18·7 g.) was started at 5.30 PM. By 6.25 PM the pH had risen to 5·8 and thereafter hourly urine collection (indwelling catheter) showed the pH rising to 6·7, 7·5 and 8·0. Many casts, mainly of the stringy variety, were seen in the 7.25 PM specimen. By 10 PM another litre of lactate was started, given with equal quantities of 5% glucose in one-fifth normal saline. A total quantity of 2·15 litres M/6 lactate and 650 ml. 5% glucose saline was given over 44 hours, at the end of which (1.15 PM on March 6) the urine was nearly clear, except for red blood-cells due to the indwelling catheter, so the drip was discontinued. Biochemical findings are shown in tables III and IV.

During the first night the patient complained of pain in the right upper thigh, and of some abdominal pain. The abdomen showed no rigidity or tenderness; peristaltic movements were heard. She vomited 1 oz. at 3 AM. On March 5 her condition was about the same; pulsation was now adequate at the ankle; BP 110/75 mm. Hg. On March 6 her temperature rose to 99° F, respirations 20 per min., BP 130/90 mm. Hg; the right leg still showed traces of erythema and was swollen as before, but the swelling was not so hard. There was still no power to extend the right foot, and flexion was weak in both feet particularly in the right. A foot splint was applied. She was apathetic and a little drowsy, but her general condition was good. The urine now contained many red cells and some leucocytes due to the indwelling catheter, which was therefore removed. Sulphanilamide was given by mouth. On the 4th day (March 7) her fluid intake by mouth was 114 oz. On the 5th day the right thigh was more swollen, and the lower leg showed pitting œdema; BP 110/65. On the 8th day biopsy was performed on the upper portion of the right peroneus muscle; this appeared normal microscopically. The patient was now rapidly recovering: the BP was 110/75 mm. Hg, and the right leg was much less swollen. Exercises were instituted.

It may be calculated from table IV that this patient (weight 40 kg.) excreted 6·6 g. of myohæmoglobin: we have found normal human muscle to contain about 5 g. per kg., so this corresponds to a minimum amount of muscle damaged equal to 1·3 kg—i.e., 32.c.cm. per kg. body-weight. (This is a minimum figure only, because we have found that totally necrotic muscle in man may have lost only 50–75% of its myohæmoglobin.) This amount of damage (30 c.cm. per kg. body-weight) in the rabbit, using a rubber band compression for 3 hours or more, will produce severe shock with limb swelling, fall in BP, and hæmoconcentration of 20–30% (Bywaters and Popjak 1942). This means a decrease in plasma volume of 28–38%. It can be calculated from the data appended on plasma volumes that this patient showed a decrease in plasma volume of 24%, or 480 c.cm., assuming her normal plasma volume to be 5% of body-weight. Table III shows that she had a hæmoconcentration (if the later hæmoglobin figures be taken as her normal level) of + 26%, corresponding to a calculated decrease in plasma volume of 33%—that is, a decrease of 670 c.cm. from a theoretical normal plasma volume (= 5% of body-weight) of 2·03 litres. According to circumference measurements, the volume of the right thigh was about 520 c.cm. greater than that of the left. But despite the fall in blood volume, which can be calculated from the dye measurements, the hæmoglobin fall and the increase in leg volume, her BP did not fall; she was in the first stage of "shock" where decrease in blood volume is adequately compensated by increased vasoconstriction. The blood became diluted rapidly, but, since the plasma-protein-concentration fell, the diluting fluid contained less protein than the serum which was lost locally.

Substances other than myohæmoglobin lost from damaged muscle include creatine, potassium, phosphorus and acid substances. No analysis for phosphorus was made. Table IV and fig. 1 show that the other substances were excreted in increased amounts in the urine, especially in the first specimen and in those passed after intravenous therapy was begun. However, the extra amounts excreted during the first two days after release (the normal being gauged by excretion on an ordinary diet on the two succeeding days) exceed the amounts expected from the quantity of muscle damaged (calculated from the pigment loss). In crush injury the necrotic muscle may lose 65–70% of its creatine and 50–90% of its potassium (Bywaters and Stead 1943). If we assume that 70% of each of these substances was lost from the damaged muscle, the amount excreted corresponding to 6 g. pigment should be creatine 2 g. and potassium 6 g.; whereas the amount of these substances excreted during the first 60 hours, over and above the basic rate of loss calculated from the succeeding 46 hours' output on a normal diet, was creatine 3 g. and potassium 10 g. It seems either that pigment is retained in the body or that extra quantities of potassium and creatine are excreted. The latter hypothesis would fit in with the findings of Cuthbertson and others (1939)—after fracture of the femur in rats, a greater nitrogen and potassium output occurred than was thought could be derived from the local tissue injury.

Note that in this case the extra urea and creatinine output (over and above the output in the third period from 62 to 100 hours after release) was greatest in the second 24 hours, whereas the excretion of potassium and creatine was greatest in the first 24. As the urine became less acid (due to treatment), the proportion of insoluble pigment became less: in the later specimens above pH 8·0 all the pigment was in solution. At no time was impairment of excretory function noted: no casts were seen in the first two specimens, and only stringy, tailed casts were washed out as a result of the diuresis in the third specimen. Within 36 hours the excretion of pigment had ceased, but some protein was still being put out; little can be said on this point, as the patient had by then a mild catheter cystitis. The urine, at first acid (pH 5·5), became neutral about 2 hours after the intravenous infusion of sodium lactate, and alkaline an hour later. The CO_2-combining power of the plasma also rose promptly in the 2 hours from 40 to 50 vols. %. The influence of this alkalinisation on the clinical course will be discussed later in relation to the other cases. It will be noted that this patient showed no rise in blood-urea or plasma bilirubin.

CASE 4

Female, aged 20, admitted to hospital at 11.10 PM, 2½ hours after being pinned down by both legs, which were painful but soon became numb. The patient was not shocked on admission or afterwards. She had passed urine last before the accident at 7 PM.

Examination at 4.15 PM showed a very fat girl with slight erythema over the lower part of the right peroneal muscles and the middle part of the left tibia. The left gastrocnemius was slightly swollen. There was no weakness of the muscles,

and only a slight numbness of the dorsum of the right foot. The circumference of the calf 6 in. below the top of the patella was 13¼ in. (right) and 13 in. (left). The buttocks were rather red and sore. BP 120/95 mm. Hg. T 99° F, P 88 per min.; R 20 per min. Urine passed at 7.05 AM and 12.30 PM on the day of admission was highly acid (pH 5·4 and 5·5) and contained no reducing substances; the later specimen showed a brown deposit containing acid hæmatin in the form of pigmented granular casts, and the supernatant fluid showed faintly the spectrum of myohæmoglobin and the met-compound. Within an hour of her receiving 8 grammes of sodium bicarbonate by mouth the urinary pH was 6·2 and 2½ hours later (with 8 g. sod. bicarb. hourly) it had risen to 8·5. Thereafter the urine was alkaline, free from pigment and adequate in quantity (fig. 2). Biochemical findings are given in tables III and IV. On the second day (March 5) the BP was 90/65 mm. Hg, but the patient was not shocked and showed no sign of plasma loss. Protein had disappeared from the urine. On the third day, BP 115/75, the erythematous patches had faded slightly, and the circumference of the legs was as before. T 100° F. Fourth day, oral intake 93 oz. On the fifth day there was still slight residual swelling of the right leg (13½ in. circumference as compared with 13 in. on the left); BP 130/90. On the eighth day (BP 130/85) slight residual pitting over the right ankle only was found. Recovery followed.

The lesser severity of this patient's injuries compared with the previous one are reflected (compare figs. 1 and 2) in the smaller amount of creatine and myohæmoglobin excreted (250 mg. and 1·1 g. respectively) and in the smaller hæmoconcentration (+ 13%, if the last figure is taken as her normal Hb. level). This means a decrease in plasma volume of 20%. The figure for the plasma volume obtained by Crooke and Morris (2·11 litres), if her normal plasma volume is reckoned to be 2·9 litres (5% of body-weight), corresponds to a decrease in plasma volume of 27%. This last figure may be rather high, since the patient was obese. There are three further interesting points in this case. The first urine was said to be normal in colour, the second was normal without any pigment in the deposit, and it was only in the third specimen of urine that pigmented casts were found in the deposit and the spectral bands of myohæmoglobin were seen in the supernatant fluid. The second point of interest is the rapidity with which protein disappeared entirely from the urine (within 24 hours). The clinical signs of crush injury were extremely slight—skin erythema and a scarcely noticeable swelling associated with complete absence of objective sensory loss and of weakness by clinical testing—yet the urine examination shows that this patient undoubtedly had suffered muscle damage and was a true case of "crush syndrome." Whether her obesity prevented any great damage cannot be said, but it probably helped to mask what little damage she had.

CASE 5

Male, aged 50, admitted to hospital at 11.30 PM, had been pinned down since 8.30 PM by both legs, which were very painful at first, the right more so than the left. Later, after about 2 hours, they became numb. He was extricated between 10.30 and 11 PM, and, after spending about a quarter of an hour in a rest cubicle, was sent into hospital. He last passed urine, before the accident, at 5 PM. Neither on admission to hospital nor subsequently did he appear to be shocked.

Examination at 5 PM on March 4 showed a drowsy man, in good general condition, BP 110/85 mm. Hg, T 99·4° F, with a severe abrasion over the point of the left elbow. The main lesion was confined to the extensor muscles of both lower legs. These were swollen and extremely hard, but with no pitting; the skin over them and over the tibial subcutaneous surface was erythematous and warm. The circumference 8 in. below the top of the patella was 14 in. (right) and 13½ in. (left). There was no sensory loss to light touch or pinprick, but a slight numbness was complained of over the dorsum of both feet and the anterior aspect of the ankle. The pulsation in both feet and in the right anterior and posterior tibial arteries was normal and the feet warm. Both extension and flexion of the toes and feet were best on the right side, and although power to flex the left foot was not grossly impaired, extension on that side was extremely poor. The urine, which he had been passing in quantity since admission, contained a brown-red deposit consisting of pigmented (acid hæmatin) casts, and was very acid (pH 5·3; see table IV). The supernatant urine was brown, containing met-myohæmoglobin. The urine reaction rapidly approached neutral after sodium bicarbonate was given by mouth (8 g. hourly in milk for four doses = 32 g.). No further pigment was excreted, and the number of casts rapidly diminished. Biochemical findings are given in tables III and IV.

By next morning the swelling had slightly diminished; the affected muscles were softer and felt doughy, as also did the right gastrocnemius; there was no improvement in power. The circumferences at the same point measured 13¾ in. (right) and 13 in. (left). BP 95/75 mm. Hg, T 99° F. A foot splint was applied. The leg measurements and the general and local condition remained the same over the next (the third) day. T 97·6° F. Fourth day, oral intake 46 oz. On the fifth day (BP 105/80) the swelling of the right leg was slightly less (13½ in.). On the eighth day (BP 100/65) the measurements of the legs were 12½ in. (right) and 12 in. (left). The patient began to get up.

Although several urine specimens were discarded before they could be examined, enough was saved to estimate that this man lost a minimum of 2 g. of pigment, corresponding to a muscle volume of 400 c.cm. The creatine loss was also extensive (about 1 g. minimum) lasting over the first 36 hours; after 48 hours, however, the urine contained neither protein nor casts. The blood showed a hæmoconcentration of + 24% (corresponding to a decrease in plasma volume of 1 litre from an estimated normal of 3·3 litres), whereas the dye method of Crooke and Morris showed a plasma volume of 3 litres, more nearly approaching the theoretical normal for his weight.

CASE 6

Female, aged 50, admitted to hospital at 11.45 PM, had been pinned down since 8.30 PM by both legs, which were crossed. They were both very painful up as far as the knee for the first hour, but after this went numb. She vomited several times. She had last passed urine at 8 PM, ½ hour before the accident. Neither on admission nor at any subsequent time did she appear shocked.

Examination at 4 PM next day showed neither swelling nor erythema above the knee, but patches of erythema were seen on the right inner femoral condyle, over the lower and outer part of the right leg above the ankle, on the dorsum of the right foot, and on the outer and inner sides of the left leg above the ankles: in the last position there was scabbing. The circumference of the legs 8 in. below the upper border of the patella was 10¾ in. (right) and 10½ in. (left). There was a well-marked swelling and doughy feeling without pitting œdema of the lower part of the right peroneal and extensor muscles, and the dorsum of both feet showed pitting œdema. Pulsation in anterior and posterior tibial arteries was good; there was no objective loss of sensation, although numbness and pins and needles were complained of as far as half way up both legs. There was perhaps very slight impairment of toe extension. BP 105/80. Urine passed at 7 AM and 12.30 PM on the first day was highly acid (pH 5·2) and showed a brown pigment deposit consisting of acid hæmatin, microscopically seen as pigmented granular casts. The supernatant urine was

TABLE III—BLOOD ANALYSIS (PER 100 ML.) IN CASES 3–7

Date and time	Hb. (g.)	CO_2cp (ml.)	Urea (mg.)	Bilirubin (mg.)	Protein (g.)	Daily fluid intake by mouth (oz.)
CASE 3						
Mar. 4 5 PM	16·4	40·4	..	..	..	..
,, 7.45 PM	..	50	..	..	7·7	36
,, 5 11.30 AM	12·6	52·8	38	..	7·2	81
,, 6 11.30 AM	13·0	53·8	25	1·1	7·3	97
CASE 4						
Mar. 4 5 PM	13·9	43·3	..	..	7·4	..
,, 7.45 PM	13·6	60	31	..	..	109
,, 5 10 AM	12·0	78·6	25	1·0	7·0	100
,, 6 11.30 AM	12·3	68·1	26	0·8	7·2	71
CASE 5						
Mar. 4 6.40 PM	16·0	55·7	..	..	7·4	55
,, 5 1 PM	13·2	74·8	38	1·1	6·6	86
,, 6 NOON	12·9	62·4	38	1·2	6·7	92
CASE 6						
Mar. 4 5 PM	14·6	39·5	..	..	7·2	59
,, 5 10.30 AM	13·4	64·3	31	0·9	7·2	113
,, 6 11.30 AM	13·5	61·4	20	1·0	7·7	131
CASE 7						
Mar. 5 10.30 AM	12·0	78·6	26	1·0	..	..

TABLE IV—URINE FINDINGS IN CASES 3–7

Date and time	ml./hr	pH	Protein	Urea	Creatinine	Creatinine	Potassium	Pigment: Total	Pigment: Supernatant	Pigment: Spectroscopic	Microscopic
			mg. per 100 c.cm.								
CASE 3											
Mar. 3–4, 7.30–12.30 PM	67	5·5	550	1120	214	100	455	271	258	MyoHb., faint met-myoHb.	Amorphous granules
,, 4 12.30–6.25 PM	40	5·8	600	2200	45	100	314	358	327	,,	,,
,, ,, 6.25–7.25 PM	240	6·7	500	2000	46	69	440	241	237	MyoHb.	Granular and stringy casts
,, ,, 7.25–8.25 PM	240	7·5	250	1270	40	47	330	176	164	,,	Cast débris and ep. cell casts
,, ,, 8.25–9.25 PM	120	8·0	250	1170	19	38	320	162	162	,,	Rare casts
,, ,, 9.25–10.25 PM	120	8·0	200	1140	23	41	280	155	153	,,	,,
,, 4–5 10.25 PM–10 AM	94	7·1	150	1220	32	53	204	105	104	,,	Nil
,, 5 10–11.15 AM	290	6·8	60	880	17	28	60	35	35	Nil	,,
,, 5–6 11.15 AM–9.15 AM	150	7·1	200	770	12	43	100	0	0	HbO_2	Many red cells
,, 6–7 9.15 AM–9.05 AM	91	7·2	90	790	12	31	65	0	0	,,	,,
,, 7–8 9.05 AM–7 AM	82	7·2	80	870	13	47	69	0	0	,,	,,
CASE 4											
Mar. 3–4 7 PM–2 AM	51	L	L	L	L	L	..	L	L	L	L
,, 4 2–7.05 AM	72	5·4	50	2000	27	118	..	0	..	..	Many hyaline and gran. non-pigm. casts
,, 7.05 AM–12.30 PM	110	5·5	120	1860	20	100	..	182	149	V. ft. MyoHb. V. ft. met-MyoHb.	Many short pigm. casts and cast débris
,, ,, 12.30–5.55 PM	86	6·2	30	1020	6	81	..	0	..	..	Squames and gran. cast débris
,, ,, 5.55–8.35 PM	133	8·5	20	730	0	53	..	0	..	..	Squames and cast débris
,, 4–5 8.35 PM–7.30 AM	46	7·2	0	1020	0	59	..	0	..	..	Stringy cast débris
,, 5–6 7.30 AM–9 AM	95	7·2	0	600	0	64	..	0	..	..	Nil
,, 6–7 9 AM–7·30 AM	64	7·2	0	590	0	81	..	0	..	..	Nil
CASE 5											
Mar. 3–4 5 PM–5.50 AM	57	5·3	60	2360	114	118	..	277	222	Met-myoHb.	Brown deposit; gran. pigm. and stringy casts
,, 4 5.50–10.50 AM	107	L	L	L	L	L	..	L	L	L	L
,, ,, 10.50 AM–3 PM	36	5·2	40	1180	3	66	..	Trace	0	..	Ditto, 30% stringy
,, ,, 3–6.30 PM	137	6·2	30	1130	9	74	..	Trace	0	..	Many pigm. casts, 70% stringy
,, ,, 6.30–8.45 PM	133	L	L	L	L	L	..	L	L	L	L
,, ,, 8.45–9.30 PM	800	L	L	L	L	L	..	L	L	L	L
,, 4–5 9.30 PM–3 AM	218	7·1	20	830	9	41	..	0	0	..	Rare hyaline stringy casts; no pigm. casts
,, 5 3–11.10 AM	92	7·1	10	830	0	60	..	0	0	..	Rare red cells only
,, 5–6 11.10 AM–1 AM	139	L	L	L	L	L	..	L	L	L	L
,, 6 1–7.40 AM	36	7·2	10	1250	0	120	..	0	0	..	Some hyaline cast debris
,, 6–7 7.40 AM–6 AM	31+	7·1	0	1750	0	109	..	0	0	..	..
,, 7–8 6 AM–10 AM	62	6·5	0	2080	0	111	..	0	0	..	..
CASE 6											
Mar. 3–4 8 AM–7 AM	60	5·2	30	1940	38	92	..	*	..	*	Many pigm. and gran. casts
,, 4 7 AM–12.30 PM		5·2	0	2000	6	79	..	*	..	*	Mod. no. gran. pigm. casts; mod. no. pus cells
,, ,, 12.30 PM–5.40 PM	115	5·6	0	880	3	52	..	..	..	..	Few pus and ep. cells; gran. cast débris
,, ,, 5.40–9 PM	91	8·8	10	730	1	52	..	..	..	..	Few pus cells; débris
,, 4–5 9 PM–8.30 AM	50	7·2	0	830	0	57	..	..	..	..	Rare red cells and gran. casts
,, 5–6 8.30 AM–9.15 AM	105	7·4	0	470	0	45	..	..	..	..	..
,, 6–7 9.15 AM–9 AM	139	7·3	0	680	0	45	..	..	..	..	..
,, 7–8 9 AM–10 AM	117	7·2	0	790	0	57	..	..	..	..	..
CASE 7											
Mar. 4 6 AM	..	5·5	0	2440	49	81	..	0	..	..	Amorphous granules
,, ,, 9 AM	..	7·2	0	2440	8	120	..	0	..	..	..
,, 5 8 AM	..	7·2	0	1360	4	96	..	0	..	..	..
,, 6 8 AM	..	9·3	0	1370	15	59	..	0	..	..	..

L = Lost. * Contained traces of acid hæmatin and met-myohæmoglobin. V. ft. = Very faint.

brown and contained met-myohæmoglobin, but there was too little to estimate quantitatively. No reducing substances were present. Within a few hours of starting sodium bicarbonate by mouth (8 g. hourly), the pH of the urine reached 8·8. The output thereafter was good and no further pigment was excreted. Biochemical findings in tables III and IV. X ray showed nothing besides a doubtful crack in the tip of the outer malleolus. Next morning the erythematous patches were fading, and power was improved. BP 110/75. Some numbness remained over the dorsum of the toes and the outer aspect of the left ankle. Leg circumferences were 10¼ in. (right) and 10¾ in. (left). On the third day her condition was still improving. BP 115/80. Leg circumferences were 10¼ in. (right) and 11 in. (left). There was still some pitting œdema of both feet, and deep bruising, more on the left. Some pins and needles in the toes was all that remained of the previous numbness on the right side, although there was an area of numbness (without pins and needles) runnning down the outer side of the left ankle. The temperature, ranging between 98° and 99° F since entry, rose to 101·6° F on the fourth day, probably because of bladder infection from the catheter; sulphanilamide was given. Oral intake, 87 oz. On the fifth day her temperature was again normal, and both legs measured 10¼ in. in circumference. BP 125/90. On the eighth day leg circumferences were 10 in. (right) and 10¾ in. (left). There was some pitting œdema on the dorsum of the left foot only. BP 110/80.

Although the clinical signs in this case were more pronounced than in case 4, much less pigment and creatine were excreted, and, with the exception of a slight trace in the fourth specimen, all urines except the first were free from protein. The blood showed a hæmoconcentration of + 8% only, corresponding to a loss of 285 c.cm. of plasma from her total calculated plasma volume of 2·2 litres. The dye method gave a figure for plasma volume only 130 c.cm. below this theoretical normal. Since this patient showed bruising on the third day, with bilirubin 1·2 mg. per 100 c.cm., whole blood loss had occurred, and it is highly probable that the slight fall in hæmoglobin noted over the first 24 hours was partly due to dilution following this blood loss.

CASE 7

Male, aged 11 years, admitted to hospital at 11.10 PM, had been pinned by both legs (? for about 2 hours). He had passed urine at 7.15 PM, before the accident, and twice while jammed in the pile of bodies. He was not shocked and had passed urine six or seven times since admission, none of which specimens were noticed by the nursing staff to be pigmented.

BP 125/70. Small areas of erythema on both shins and on the lateral aspect of the left ankle, where there was slight muscle swelling. Circumference of the legs 6 in. below the top of the patella was 10¼ in. (right) and 9¾ in. (left). There was

no anæsthesia and no loss of power or pulsation. Urine passed at 6 AM on March 4 was clear, showed no casts, but was acid (pH 5·5). He was given sodium bicarbonate (4 g. hourly by mouth) from 8 PM, and by 9.05 PM the pH had risen to 7·2. Blood analysis in table III. Condition excellent on eighth day. BP 100/55.

This was a very slightly injured patient whose only clinical signs were erythema and slight swelling; the only biochemical sign was the excessive amount of creatine in one of the samples passed on the first day: only a few of these urines were available for examination and none contained protein.

CASE 8

Female, aged 23, admitted to a local hospital at 10.40 PM on March 3, and transferred to another hospital next day, had been pinned by both legs and the left arm, which were at first painful and then numb. No albumin or blood was noticed in the acid urine on the second and third days after injury. The left calf was numb, swollen and painful on admission.

Examination on the 15th day showed a fading erythematous patch on the anterior aspect of the left leg. The peroneal muscles were very soft and flabby compared with the normal right side. Flexion of the toes was weak and extension was entirely lost. BP 125/60 mm. Hg. Urine on the 18th and 19th days contained 2·1 and 2·4% urea and no protein or casts.

CASE 9

Male, aged 39, admitted to a local hospital at 11 PM on March 3, and transferred to another hospital next day, had been pinned by both legs; pins and needles developed, followed by pain and then numbness and swelling. No blood was noticed in the urine; no albumin had been found.

Examination on the 16th day showed fading erythema of both shins. The muscles appeared flabby but there was no apparent swelling. There was some numbness of the second and third toes on the left, and a well-marked extensor paralysis. Biopsy of the affected muscle at 3 weeks showed only a few normal fibres left—some of which were swollen and vacuolated; the rest of the fibres had disappeared, to be replaced by small muscle-fibres regenerated from the sarcolemma (fig. 3). Urine on the 18th and 19th days showed 1·8 and 2·2% urea and no protein or casts. Complete recovery (May 3).

CASE 10

Female, aged 40, admitted to a mission hospital at 10.30 PM, had been pinned by the chest and both legs for about 2 hours. Urine the next morning was clear, sp. gr. 1010, and contained no albumin.

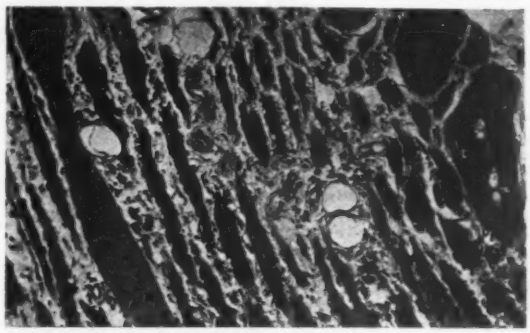


Fig. 3—Case 9. Microphotograph of peroneal muscle (× 100), stained hæmatoxylin and eosin. Note few large muscle-fibres with central nuclear proliferation (left) or vacuolation and swelling (right). These are original fibres. The remainder are small new fibres regenerated from sarcolemmal sheaths; black masses of proliferating sarcolemmal nuclei are seen together with a subsiding interstitial inflammatory reaction.

Examination on the 2nd day showed only skin erythema over the shin bones. No casts were found in the urine.

CASE 11

Male, aged 14, admitted to the mission hospital at 11 PM, had been pinned by both legs. Urine passed after entry was not noticed to be abnormal.

Examination on the second day showed widespread erythema on the anterior aspect of both legs below the knee, and on the dorsa of both feet; there was no apparent swelling and no loss of power or sensation.

CASE 12

Male, aged 56, seen in hospital on the 15th day after the disaster with a nerve compression palsy of the right arm (without muscle or skin lesions) and an extensor palsy of both legs, with faint signs of a fading erythema on the shins. No blood had been noticed in the urine, but albumin had been present on admission.

While no detailed observations were made on these last five cases, they obviously had the same lesion as the preceding cases: cases 8, 9 and 12 had even suffered a more severe injury than cases 6 or 7, by clinical criteria. Cases 10 and 11, with erythema only, are cited only because they show the effects of this injury in its mildest form.

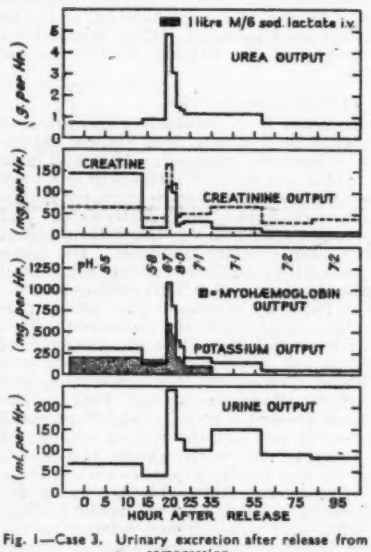
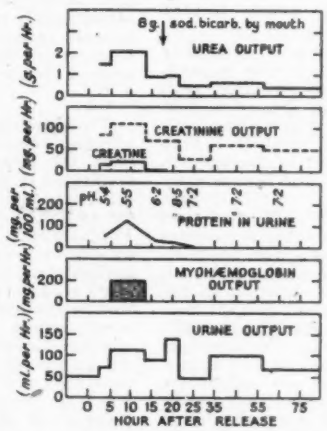


Fig. 1—Case 3. Urinary excretion after release from compression.



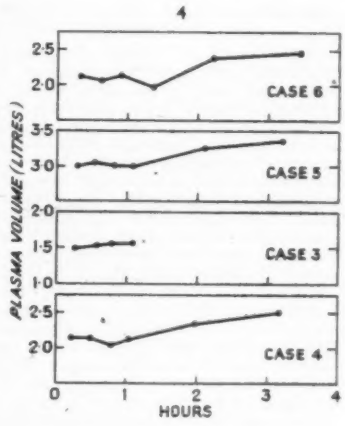


Fig. 2—Case 4. Urinary excretion after release from compression.

Fig. 4—(Addendum of Crooke and Morris). Plasma-volumes measured by Evans blue method. Evans blue injected at zero time in each case.

	Case 6	Case 5	Case 3	Case 4
Weight (kg.)	44·0	66·2	40·6	58·1
Mean plasma volume (l)	2·11	3·03	1·55	2·11
% of body-weight	4·83	4·59	3·82	3·63
Max. deviation from mean	2·4	2·6	2·6	2·4

PLASMA LOSS

The calculation of the amount of plasma lost (by leakage into the damaged area) from the hæmoglobin fall entails three assumptions:

(1) That no bleeding has taken place, either internally or externally; this would produce hæmodilution in the first 24 hours and lead to a lower ultimate level, thus increasing the apparent loss.

(2) That the plasma volume before the accident was "normal" for the weight. (It is said to parallel more closely the surface area.)

(3) That the total blood volume after stabilisation is the same as before the plasma loss.

The conclusion from assumptions (1) and (3) is that the hæmoglobin level after stabilisation is the same as before the accident. That these assumptions are not always valid may be seen by reference to table V, which summarises cases 3–6; the severity of the injury clinically runs parallel to the amount and duration of the pigment, "protein" and creatine elimination in the urine. In case 5, however, the plasma loss calculated from hæmoglobin change is too large; this might be due to bleeding. In case 4 the plasma loss calculated from the data of

TABLE V—SUMMARY OF FINDINGS IN CASES 3–6

Case	Plasma loss (ml.)		MyoHb. excretion		Creatine excretion		"Albuminuria" (hr.)	Severity of lesion clinically
	Calc. from Hb. change	Calc. from data of Crooke and Morris	g.	hr.	g.	hr.		
3	670*	480	6·6	36	4·1	120+	104+	+++
4	580	800	1·1	14	0·25	19	22	+
5	1000	270	(2·0+)	20–28	(1–2)	28	57	++
6	285	130	Tr.	8	0·25	22	8	(+)

* Increase in leg volume compared with uninjured side from circumference measurements = 520 ml.

Crooke and Morris also appears on the high side, perhaps owing to the patient's obesity. Otherwise the calculated losses are consistent with the clinical data, and also in case 3 with the plasma loss calculated from the increase in volume of the thigh compared with the uninjured side.

None of these patients showed fall of blood-pressure to shock levels—that is, vasoconstriction was able to maintain a normal blood-pressure "compensating" adequately for the small fall in total blood volume due to plasma loss—the "first stage" of "shock."

COMPARISON WITH CRUSH SYNDROME AFTER BURIAL BENEATH DEBRIS

Most cases of crush syndrome proper, ordinarily recognised after air-raid damage, are severely injured, with gross and often progressive limb swelling, with clinical "shock" (by which is usually meant a thin thready pulse and a decreased blood-pressure), and with renal function impaired sufficiently to produce a high degree of uræmia or death. Minor grades of damage are, however, being increasingly recognised and occasionally reported as showing the beneficial effects of this or that kind of therapy. But the minor grades still often pass unrecognised, and, until uræmic death occurs, sometimes even the more severe grades. Recently a case has been reported (Albert and Mitchell 1943) from the last war, with an ischæmic contracture and calcification in the injured area, such as is seen in the rabbit subject to a similar experimental injury (Bywaters and Popjak 1942). The diagnosis can now be made earlier. The series of cases reported here illustrates the gradation of injury very well. Observations on case 2 are not sufficiently detailed for us to be able to account for the development of the uræmia; the patient had suffered as regards extent and duration of the compression similarly to case 3; it seems probable that the degree of swelling had been greater, judged by the residual skin looseness. She had also had no alkali treatment. In the remainder of the cases the pH of the urine was relatively high, 5·2–5·5, compared with the pH of 4·6–5·0 observed in both mild and severe air-raid cases.

DURATION OF COMPRESSION

We have shown in rabbits subject to a standard compression with rubber tubing that the pH following release does not fall after periods of compression of one hour; that it falls only very slightly (7·0 to 6·7) after periods of two hours; and that after periods longer than three hours a maximal fall (e.g., down to 5·5) is obtained. Observations of the degree of hæmoconcentration, blood-urea rise and creatine excretion indicate that, while little damage is done by compressions of an hour or less, maximal damage is produced with compression for three hours or more; in between seems to be the critical period, in which ischæmia produces irreversible changes. The exact length of this critical period may be determined by such factors as temperature (from the work of Allen in 1938).

The period of compression in this series lasted from 8.30 PM to 10 or 10.30 PM (i.e., 1½–2 hours) in the mildest cases (cases 10 and 11), and from 8.30 PM to 10.30 or 11 PM (i.e., 2–2½ hours) in the five patients (cases 1, 3, 4, 5 and 6) in one hospital (allowing half an hour for extrication and carrying to hospital). This is a shorter time than any of the previously observed cases of limb compression due to falling masonry, and may be related to the mild degree of damage and absence of shock. It seems possible that, for periods shorter than 2–3 hours, the ischæmia might be insufficient to produce total necrosis with accumulation of much local fluid, but adequate to produce a local increase of cell-permeability with loss of pigment. In the case of spontaneous myohæmoglobinuria described by Millikan (1939), exercise was followed by loss of myohæmoglobin and potassium from the muscles, without apparently any permanent damage. In a case we have described (Bywaters and Dible 1943) probably of this nature, no residual damage from previous attacks was noted. In the rabbits compressed for shorter periods than three hours, only a slight and transient hæmoconcentration occurs, there is no fall of BP, only a slight fall in urinary pH and no local limb swelling; histologically only a few fibres scattered here and there in the compressed area show degenerative change, and regeneration rapidly takes place from the sarcolemmal nuclei. The change is very similar to that observed in the biopsy material from case 9; although no histological material from air-raid cases later than the ninth day has been seen, it is certain that, just as in the rabbit compressed for over three hours, there is complete irrecoverable necrosis with gradual replacement fibrosis spreading into the infarct from the edges, with gross calcification. No hint of any such process was seen in case 9. If the ischæmic limb is maintained at a low temperature, the critical period becomes longer. In this series the ischæmic areas were probably rather warmer than in air-raid cases, since they were compressed against other tightly packed human bodies, instead of, as in the air-raid cases, against cold masonry. This would tend to increase the severity of the damage relative to the time of compression.

PIGMENT EXCRETION

The chief variable other than duration of compression affecting the severity of the lesion is, from clinical experience, the amount of muscle damaged. This has been confirmed in the rabbit; a direct relationship has been established between the amount of muscle rendered necrotic and the secondary changes observed (Bywaters and Popjak 1942). In man a good index to this is the amount of myohæmoglobin and creatine released. We have noticed, however, that with renal impairment only a small portion of the pigment is excreted. This clinical impression is confirmed in three air-raid casualties whose pigment output has been quantitatively measured. Two who succumbed with renal failure showed an output of 1·2 and 0·285 g.; in one patient of Dr. Pochin's who recovered with alkaline therapy Dr. Rimington measured 3·5–4 g. total output (Bywaters et al. 1941). The severest of the four present cases in which pigment excretion was measured put out the record amount of 6·6 g. We have recently shown (Bywaters and Stead, unpublished data) in the rabbit injected with human myohæmoglobin in amounts comparable per kg. bodyweight to that liberated in man, that the renal damage seen in animals with acid urine is not related to the amount of pigment injected, nor to the amount of pig-

ment excreted, but to the amount of pigment retained. As in the human cases, it seems probable that the pigment is retained chiefly because of the failure to excrete; in the rabbit experiments, however, it is difficult to see what causes the renal failure other than the injected solution of myohæmoglobin or some impurity therein. The alternative possibility exists, therefore, that the retention of pigment may initiate renal failure. Further experiments are in process and no full answer can yet be given, but these human cases illustrate that arguments based on the failure to produce renal failure in animals with concentrations in the urine and total amounts injected on a basis of body-weight much greater than in human crush cases do not eliminate myohæmoglobin as a causative agent in man.

ALKALI THERAPY

The fact that five cases whose urine was rapidly made alkaline showed no renal failure, whereas one case subject to exactly the same trauma of a similar duration and extent, but without alkalinisation, subsequently developed uræmia is no complete proof of the efficacy of alkali. While the pH of the urine was changed from 5·5 to 6·7 within two hours, it was not until eighteen hours after release that alkali therapy was started. We know that in air-raid casualties with only slight injuries no renal failure will develop, alkali or no alkali. Case 3 was really the only one in which there is the possibility that alkalinisation affected the course. It is possible that the lesser degree of urinary acidity seen initially in this case compared with other air-raid cases with a similar extent of lesion, together with the absence of clinical "shock" with its resultant oliguria, is the correct explanation of the lack of renal impairment. Unfortunately the corresponding data on case 2 which would have thrown light on this point are not available.

SUMMARY

Of 12 patients who had been pinned down in a shelter by other bodies, one died of other injuries soon after release; one developed a high grade of uræmia but ultimately recovered; and the other 10 showed every grade of injury from severe muscle damage to skin erythema only, and all recovered.

The course was similar to that of the "crush syndrome"—ischæmic muscle necrosis following burial beneath debris as the result of aerial bombardment—but less severe, perhaps because of the short time of compression (1½–2½ hours).

Quantitative estimation of myohæmoglobin, creatine and potassium excretion gave a basis for the calculation of the amount of muscle damaged; this was the best guide to the severity of the lesion and ran parallel to the duration of albuminuria and to the local plasma loss as calculated from (*a*) hæmoconcentration, (*b*) Crooke and Morris's figures for dye distribution and (*c*) limb swelling.

No conclusions can be drawn as to the efficacy of alkali therapy.

PLASMA-VOLUME DETERMINATIONS BY THE EVANS BLUE METHOD

An estimation of plasma volume by the Evans blue method of Crooke and Morris (1942) was made on 4 patients (cases 3, 4, 5 and 6). The results are shown in fig. 4, in which the apparent plasma volume is plotted against the time after injection of the blue dye. The curves are typical, showing that the concentration of the dye remained constant throughout the first hour and thereafter the dye disappeared at the usual rate of about 5% per hour. The true value is represented, therefore, by the average of three readings taken during the first hour. These are as follows:

Case	*Plasma vol. in litres*	*Plasma vol. % body-weight*
6	2·11	4·83
5	3·03	4·59
3	1·55	3·82
4	2·11	3·63

The average normal is taken as 5% body-weight with a normal range of 4·5–5·5%. There was a significant reduction in plasma volume in cases 3 and 4, but in the other two patients it was within the normal range.

These estimations were made between 3·15 and 4 PM, some 17 hours after release from compression.

(*Continued at foot of next column*)

LOCAL THERAPY OF WAR WOUNDS

II. WITH SULPHASUXIDINE *

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THE investigation of succinyl sulphathiazole ('Sulphasuxidine') in the Central Pathological Laboratory, MEF, confirmed its claim to be a drug of interesting and valuable properties. When taken by mouth it is to a small extent broken down to sulphathiazole in the intestinal tract, and while absorption is very slight even when doses of 60 g. are taken daily, all organisms except fæcal streptococci are eliminated from the fæces, and clinical improvement in dysentery is manifest. Its use in colonic surgery, and in the management of abdominal gunshot wounds, is clearly indicated.

It was decided to investigate its properties as a local therapeutic agent in infected gunshot wounds.

Absorption of Sulphonamides

One of the main problems in all sulphonamide therapy is to ensure that neither the rate nor the degree of absorption is great enough to cause severe toxic symptoms or other complications due to sulphonamide poisoning. This problem becomes particularly acute when these drugs in the powder form are applied to open wounds. It is therefore not irrelevant at this stage to give a few examples of the rates of absorption encountered when various sulphonamide derivatives were applied externally or given intraperitoneally or intramuscularly. The examples given below include: some burn cases which were treated with sulphonamide powders or emulsions; 2 cases of sulphadiazine given intraperitoneally; 1 case of sulphathiazole given in the same way; and comparisons of absorption rates of sulphanilamide, sulphathiazole and sulphasuxidine in rabbits. Only the absorption is dealt with, the clinical results being discussed elsewhere.

CASE A.—Extreme third-degree burns of both legs; powdered with 17 g. of sulphanilamide, three weeks after injury. The rise of blood concentration was as follows:

Hours after powdering ..	½	1	2	3	4	5	7½	10½	23	26
Blood concentration (mg. per 100 c.cm.)	6·9	11·4	13·3	13·3	14·4	17·0	16·1	17	15·1	13·0

CASE B.—Treated with 35 g. of sulphanilamide after only 35 min. delay. The blood concentration after 6 hours was 25 mg. per 100 c.cm.; after 24 hours 16·7 mg., followed by a gradual fall.

Several cases were treated with sulphaguanidine and sulphathiazole powders, the burns being of the same order of severity as those in cases A and B. With these two drugs the blood value was far lower.

* Part I, dealing with penicillin, appeared last week.

(*Continued from previous column*)

I am indebted to Sir James Walton, Mr. W. H. Rothwell, Dr. I. A. J. McCready and Dr. A. J. Watson for allowing me to see patients under their care; to Dr. A. C. Crooke and the nursing staff for their help; to Miss Stead (for whose services we are dependant on a grant from the Medical Research Council) who performed the biochemical analysis; and to Dr. Keith Simpson for giving me access to post-mortem material and allowing me to quote his own report.

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CASE C.—Sulphathiazole, 10 g., was put on an extensive second-degree, patchy third-degree, burn 4 hours after injury and the blood concentration never rose above 3 mg. per 100 c.cm.

The low level was maintained when sulphaguanidine was used, characteristic figures being 5·7 mg.; 3·5 mg.; 1·1 mg. If the drugs were applied in the form of an emulsion, however, the blood concentration remained low even in the case of sulphanilamide. Figures obtained with sulphanilamide and soft-paraffin emulsion included 1·2 mg.; 0·94 mg.; 3·8 mg.; 1·4 mg. One fatal case was noted after treatment with sulphanilamide in which the blood concentration reached 40 mg. In many of these cases the urinary concentrations tended to be high. These results show that it is dangerous to use the more soluble sulphonamide drugs in the powder form over wide areas.

Two patients on whom appendicectomies were being performed received powdered sulphadiazine intraperitoneally. This drug has a low solubility (13 mg. at 37° C. and pH 7·2) and the rate of absorption was low. After 10 g. intraperitoneally at 10.30 AM on Oct. 23 the blood concentrations were:

Date in Oct. 1942	23	23	23	23	24	24	25	26	28
Time ..	12.30 PM	2.30 PM	6.30 PM	10.55 PM	10.30 AM	6.30 PM	10.30 AM	10.30 AM	10.30 AM
Conc. of free drug (mg. per 100 c.cm.) ..	1·8	2·2	2·7	3·2	2·2	1·8	1·4	1·04	0·46

The second set of figures are not reliable since the patient had received sulphanilamide by mouth before the operation; however, the increase in blood concentration followed a similar course to the one shown above.

One patient received 10 g. of sulphathiazole intraperitoneally at 11 AM on Jan. 9, and the figures for the blood concentration were:

Date in Jan. 1943	9	9	9	10	12
Time ..	2 PM	4 PM	6 PM	12 Noon	12 Noon
Conc. of free drug (mg. per 100 c.cm.)	4·07	5·28	5·4	2·6	0·37

STUDIES ON SULPHASUXIDINE

The advent of sulphasuxidine seemed to introduce obvious advantages. When this drug is given orally the amount of absorption is extremely low, the blood value being about half that found with sulphaguanidine even when the dosage exceeds 20 g. daily. It seemed possible that if sulphasuxidine was put into a wound or on a burn, a reservoir of free sulphathiazole would be produced as the drug was slowly broken down. Previous workers had claimed that sulphasuxidine is split by bacteria to yield free sulphathiazole, and because of this it seemed possible that external application would provide a continuous potential source of free sulphathiazole, the rate of breakdown being roughly proportional to the severity of the infection. The rate of absorption and degree of breakdown were compared with those of sulphanilamide and sulphathiazole.

Some experiments were carried out with sulphanilamide, sulphathiazole and sulphasuxidine based on the experiment of Hawking.[1] A transverse incision was made in the lumbar muscles of rabbits (weight 1000 g.) and 0·25 g. of drug, made into a paste, was inserted. The fascial covering of the muscle was sutured and any surplus drug wiped away. The skin wound was also closed; 6 and 24 hours later the rabbits were killed and transverse slices of lumbar muscle about 0·5 cm. thick were taken at various distances from the wound. Heart blood, and muscle from the opposite thigh, were also taken. The concentration of free drug was then determined, the results being expressed as mg. of drug per 100 c.cm. of blood or per 100 g. of muscle (table I).

1. Hawking, F. *Brit. med. J.* 1941, i, 263.

TABLE I—CONCENTRATION OF SULPHONAMIDES AT VARIOUS DISTANCES FROM AN EXPERIMENTAL WOUND, AND IN THE BLOOD, 6 HOURS AND 24 HOURS AFTER APPLICATION

Sulphonamide and period of application	Muscle concentration (mg./100 g.)				Blood concentration (mg./100 c.cm.)
	Sides of Wound	1–2 cm. away	4 cm. away	Opposite thigh	
Sulphanilamide (6 hr.)	220	29	1·7	1·8	2
Sulphanilamide (24 hr.)	20	3·7	3·6	1·1	Trace
Sulphathiazole (6 hr.)	Solid drug still present	185	14	2	0·4
Sulphathiazole (24 hr.)	230	26	6	4	0·5
Sulphasuxidine (6 hr.)	F: 0·75 T: 243	F: 47 T: 14	F: 3·6 T: 4·7	F: 3·4 T: 4·6	F: trace T: 0·82
Sulphasuxidine (24 hr.)	A low uniform concentration in all specimens amounting to about 1 mg. per 100 g. The amount of water used in extracting the specimen was too large for accurate estimation.				..

F = free. T = total.

These results are in agreement with those observed in the treatment of burns. The more soluble sulphanilamide rapidly reaches a maximum concentration and is rapidly excreted, whereas sulphathiazole diffuses far more slowly. In the case of sulphasuxidine there is a progressive and decreasing difference between the free and the total drug demonstrating once more the capacity of plasma to break down sulphasuxidine into the free compound.

Further experiments were carried out to show the rates of absorption when sulphanilamide, sulphathiazole and sulphasuxidine were put in the peritoneal cavity of a rabbit, the drugs being suspended in lanoline and in saline. The blood concentrations were estimated 24 and 48 hours afterwards and all the rabbits were killed after 7 days (table II).

TABLE II—RATES OF ABSORPTION OF SULPHONAMIDES FROM PERITONEUM OF THE RABBIT

Experiment	Concentration (mg. per 100 c.cm. of blood) after:		
	24 hr.	48 hr.	7 days
1. Sulphanilamide in saline, 10 c.cm. of 20% suspension	4·0	0·89	Large fat clot in peritoneum.
2. Sulphathiazole in saline, 10 c.cm. of 20% suspension	1·1	2·2	Nil abnormal.
3. Sulphathiazole in lanoline, 10 c.cm. of 20% suspension	0·83	0·62	Fat clot as in 1.
4. Sulphasuxidine in saline, 10 c.cm. of 20% suspension	F: Faint trace T: 2·3	F: 0·5 T: 2·3	Nil abnormal.
5. Sulphasuxidine in lanoline, 10 c.cm.	F: Nil T: 0·6	F: 0·6 T: 1·5	Fat clot as in 1.

F = free. T = total.

As was expected, these experiments showed greater absorption from the saline than from the lanoline; and, as before, the more soluble sulphanilamide was absorbed the quickest. The fat clot on section showed a high degree of organisation. It had all the appearances of fatty tissue (i.e., alveoli with fine fenestration); on the outside was a layer of coagulated lymph and medial to this an area of intense infiltration with polymorphs and large mononuclear cells.

A few experiments were carried out in vitro to determine the degree of breakdown of sulphasuxidine in various fluids. A very small amount of the drug is liberated when a tablet is broken and shaken with water. This breakdown increases with rise of temperature and with increase of time between suspension and estimation, but even after 24 hours at 37° C., a 0·5 g. tablet in 100

c.cm. of water gave a concentration less than 0·5 mg. In suspension with dilute acids or alkalis the breakdown is increased. One of the main difficulties of estimating the breakdown is that the estimation must be carried out in acid solution, and hence there is a danger of increasing the breakdown; in alkaline solutions there is a danger of causing precipitation. The drug is completely broken down to free sulphathiazole by heating with mineral acids on a water-bath. A suspension of the drug in the presence of fæcal matter showed a concentration of free sulphathiazole three times as great as the control. Suspensions in plasma or serum or pus showed a considerable increase in breakdown as compared with suspensions in water, and this remains true even if the serum has been heated to 56° C. for two hours. Figures varied widely, as the following show:

—	Sulphasuxidine, 0·5 g., plus:			
	Pus (10 c.cm.)	Pus (5 c.cm.) and saline (5 c.cm.)	Water (10 c.cm.)	Saline (10 c.cm.)
Concentration of free sulphathiazole after 17 hr. at 37° C. (mg./100 c.cm.)	150	56	9·0	9·3

Other samples gave lower figures, such as 46 mg. per 100 c.cm.; 35 mg. and 42 mg., when estimations were carried out as above using 10 c.cm. of pus; 2 samples of pleural fluid gave values of 45 mg. and 25 mg.

Estimations were also carried out on the fluid from wounds into which 20% sulphasuxidine in lanoline had been put. About 30 c.cm. were usually put into the wound and an estimation of the free drug in the wound fluid was made after 24 hours. The amount of free sulphathiazole varied considerably, figures including: 2·2 mg. per 100 c.cm., 2·6 mg., 32 mg., 27 mg., and 35 mg. The blood concentrations never exceeded 1 mg. of free drug. In one case where powdered sulphasuxidine was put into the wound, a concentration of 150 mg. was found in the wound fluid. This result was unreliable owing to solid particles of the powder still remaining.

CONCLUSIONS ON ABSORPTION

Experimental findings suggest that:

1. The probable rate of absorption of sulphonamide drugs can be forecast from a knowledge of their solubilities.
2. The most soluble are most likely to produce dangerously high concentrations and are best used in suspension.
3. The breakdown of succinyl sulphathiazole into free sulphathiazole in ordinary solvents—including plasma, cerebrospinal fluid and fluid from wounds—is too small to produce a dangerous blood concentration.
4. The breakdown is increased by rise of temperature.

Therapeutic Tests

Sulphasuxidine applied locally in the form of a 20% anoline cream appeared to limit quickly and effectively the gram-positive flora, to control suppurations and accelerate healing. No toxic or irritant properties of any kind were noted. Absorption was less than 1 mg. per 100 c.cm. of blood. The cream was heated to 40° C., and then applied to wounds with a syringe used as a grease-gun.

It is quite possible that other sulphonamides applied in this way would have given equally good results; however, the "reservoir" potentialities of sulphasuxidine are, at present, a unique feature from a theoretical point of view. If this drug is used intraperitoneally, the lanoline cream should not be used, as it acts as a foreign body. Probably a microcrystalline form would be best.

Results in 8 cases are set out in table III.

DISCUSSION

HEALING OF WOUNDS

This series of cases is a small one. For this there are several reasons—the length of time taken on account of the individual care required, the movement of patients to other centres necessitated by Service conditions, and the number of other duties in a routine laboratory. Moreover, most wounds are encased in plaster and are inaccessible. The results are presented in an attempt to encourage the local treatment of wounds, and in the belief that this is not carried to its logical conclusion at present. If it be granted that sulphonamide prophylaxis by local application is of value, and if it is further established that its action, owing to breakdown and absorption, is temporary, then it is reasonable to suggest that repeated application can extend the prophylactic value. The same argument holds for penicillin treatment; observation shows that one application will not give permanent results, and the process must be continued. Similarly, all local applications must be made on a raw surface; pus must be removed.

Up to the present, the number of Allied wounds have fortunately been few compared with the numbers in the last war. The total allied casualties in the battle of El Alamein were less than those inflicted in two days of the Somme battle. Surgeons in this war to date cannot speak from anything like the experience of those of the last war. They have however modified greatly last-war methods, in particular with regard to closed-plaster technique.

The advantages of this method are obvious even to one not a surgeon. The relief of pain, and ease of nursing of a patient with the severest injuries is striking. It is obviously admirable for a large number of cases, but it does interfere with local treatment of infection.

One compromise is the use of a window in the plaster, and this has been used in some of the cases described. Its disadvantages are: first, the risk of new infection, though this in our opinion is more than balanced by the benefit of the therapy; and the more serious disadvantage that the wound tends to bulge out through the window, compressing the edges, and causing pain. Here a further compromise is possible. After a period during which the wound is locally treated, it may finally be covered in plaster, and the unequal pressure readjusted.

Three cases in this series were disappointing. One was a compound fracture of femur, infected with hæmolytic *Staph. aureus* and hæmolytic streptococci. It showed no reaction at all to penicillin, even applied thrice daily in a 1% solution, and even though the organisms in vitro proved susceptible; it did not react to sulphathiazole microcrystals, to sulphasuxidine, or to proflavine. Two others showed an initial reaction to penicillin, but then regressed to their former bacteriological picture; and sulphasuxidine also proved ineffective. These were both compound fractures with exposed bone, and all were first treated at least a month after wounding.

One of these cases was then treated with proflavine powder, and the wound was covered with a wire cage. It scabbed over, and the profuse suppuration ceased. On two occasions associated with the lighting up of wounds elsewhere this wound too became active, and brisk suppuration set in; but when the pus had been cleaned away the infection again subsided, and was eventually put up in closed plaster, well on to complete healing.

No-one can observe the process of healing in wounds without being impressed by certain facts. The minimum interference with a surface is essential; to drag off adherent dressings, and even soft-paraffin gauze, is to inflict pain, and to delay healing. In many cases a wire cage applied on top of the window, above the plaster, and covered with cotton-wool, is the best "dressing;" the wound surface is left open. Secondly, aspiration of pus and the use of many-tail bandages to avoid all movement of the limb, gives the patient ease and makes him look forward to the dressing, not with apprehension but with relief.

Finally, gross as is the disturbance caused by a suppurating wound to a patient's general well-being, the converse is equally true: a wound showing no tendency to heal undergoes a profound change when the patient's general condition improves; attention to his diet, his psychological state, his general comfort are all part of the essentials of wound treatment. While this argument can scarcely be pursued without leaving the confines of pathology, it is within the province of that craft to insist that the increased metabolism of fever, the gross protein loss of suppuration, the diminished appetite caused by the malaise of sepsis all render the dietetic control of such a patient an urgent problem. It may, indeed, be the greatest single necessity; in its absence other methods are relatively useless, in its presence the need for them far less.

TABLE III—EIGHT CASES TREATED WITH SULPHASUXIDINE CREAM (SX. CR.) OR SULPHASUXIDINE POWDER (SX. P.)

Case and date	State of wound and progress	Treatment	Smear (S) and Culture (C)
CASE 1	Patchy 3rd degree diesel-oil burns, both hands; sl. suppuration	Sodium sulphate	..
Nov. 6, 1942	Cleaned and dressed	10 c.cm. of sx. cr. on each hand	S: pus cells + + ; gram-pos. cocci and gram-neg. bacilli in mod. nos. C: no hæmolytic streptococci; *Staphylococcus albus*; coliform bacilli
Nov. 10	Both hands healing. Small patch 3rd degree, rt. hand, not healed	7·5 c.cm. of sx. cr. on each hand	S: pus cells +; few gram-pos. cocci and gram-neg. bacilli. C: a few *Staph. albus*
Nov. 11	Blood concentration: nil	..	..
Nov. 16	No discharge; all areas healing well	5 c.cm. of sx. cr. on each hand	S: a few pus cells; no organisms. C: sterile
Nov. 17	Blood conc.: nil	..	..
CASE 2			
Nov. 2, 1942	Gutter-wound rt. shoulder, 4 × 2 in., extending down and in from post. axillary border over wing of scapula. Slightly dirty	Eusol dressings and oral sulphonamides	..
Nov. 8		Sulphonamides stopped, after 21 g. given	..
Nov. 10	Wound v. dirty and foul smelling; fair amount of discharge	10 c.cm. of sx. cr. over shoulder	S: pus cells + + + ; gram-pos. cocci in large nos. C: hæm. *Staph. aureus*, and hæm. strep., mod. growth
Nov. 11	Blood conc.: 0·2 mg. per 100 c.cm.	..	..
Nov. 15	No discharge; wound pink and healthy; pt. feels well	10 c.cm. of sx. cr.	S: pus cells + + ; few gram-pos. cocci. C: hæm. *Staph. aureus*, a few colonies
Nov. 19	Clean wound; no discharge	4 g. of sx. p. to wound. Final treatment	S: few pus cells. C: sterile
Nov. 20	Blood conc.: nil	..	..
CASE 3			
Nov. 9, 1942	Foul-smelling severe wound of lt. thigh with great skin loss and gross infection; oozing dark green pus from pocket connected with surgical incision on other side. Pt. felt well. Eusol used to deodorise, not applied to wound	20 c.cm. of sx. cr.	S: pus cells + + + ; heavy infection with gram-pos. cocci and gram-neg. bacilli. C: hæm. strep.; *Staph. albus*; coliform bacilli
Nov. 12	Copious discharge, foul-smelling, greenish-yellow; much pus aspirated from pocket	Same	S: pus cells + + + ; gram-pos. cocci in large nos. C: free from hæm. streps.
Nov. 13	Much less discharge and smell; tissues looked healthy. Pt. much better	,,	S: pus cells + + + ; mod. nos. gram-pos. cocci. C: hæm. strep., mod. growth
Nov. 14	Little discharge; still a little pus collecting in deep pocket; dull pain below wound during night	,,	S: pus cells + + ; mod. amount of gram-pos. cocci. C: hæm. strep., mod. growth
Nov. 15	Pt. fit; no discharge; clean passage from wound to incision on other side	,,	S: pus cells + + ; mod. nos. gram-pos. cocci. C: hæm. strep., mod. growth
Nov. 17	No discharge; nothing aspirated; tissues healthy	,,	S: pus cells +; a few gram-pos. cocci. C: hæm. strep., a few cols.
Nov. 19	No discharge; tissues healthy	,,	S: A few pus cells; a few gram-pos. cocci. C: hæm. strep., 4 cols.
CASE 4			
Oct. 23, 1942	Through-and-through wound, lt. thigh	Sulphanilamide and soft-paraffin gauze	..
Nov. 3	Dirty entry and exit wounds, heavily infected, much loss of skin; connected by drains; exuding large amount of foul-smelling greenish pus	10 c.cm. of sx. cr. to wounds	S: pus cells + + + ; mod. nos. gram-pos. cocci. C: hæm. *Staph. aureus*, free growth; coliform bacilli
Nov. 4	Blood conc.: nil	..	..
Nov. 5	Both wounds healthy; little discharge; pt. felt well	Same	S: pus cells + + ; few gram-pos. cocci and gram-neg. bacilli. C: *Staph. aureus*, 10 cols.: pyocyaneus, a few cols.
Nov. 8	Drain removed; wound healthy, a little discharge	,,	S: pus cells + + ; few gram-neg. bacilli. C: pyocyaneus, few cols.
Nov. 9	Blood conc.: nil	..	..
Nov. 11	No discharge from wound; no complaints	,,	Scanty pus cells; few gram-neg. bacilli. C: pyocyaneus, few cols.
Nov. 12	Blood conc.: nil	..	..
Nov. 19	2 dry dressings since last treatment. Ready for skin graft	..	..

TABLE III—(*continued*)

Case and date	State of wound and progress	Treatment	Smear (S) and Culture (C)
CASE 5	Perforating wound, lt. side chest wall. Fracture of ribs 9, 10 and 11	Sulphanilamide, soft-paraffin gauze, eusol dressings	..
Nov. 11, 1942	V. deep unhealthy-looking wound, tender to touch; copious discharge; fairly foul smell. Compound fracture of ribs; old empyema operation	7 c.cm. of sx. cr.	S: pus cells + + +; mod. nos. of gram-pos. cocci and gram-neg. bacilli. C: haem. strep., free growth; coliform bacilli
Nov. 12	Mod. amount of discharge, removed by suction; fairly clean wound left; no smell	10 c.cm. of sx. cr.	S: pus cells + +; mod. nos. gram-pos. cocci. C: haem. strep., free growth
Nov. 13	Little discharge; all tissue pink and healthy	7·5 c.cm. of sx. cr.	S: pus cells +; a few gram-neg. bacilli. C: coliform bacilli, few cols.
Nov. 14	Pt. well; dull pain during the night. No discharge; wound beginning to granulate	6 c.cm. of sx. cr.	S: pus cells +; few gram-pos. bacilli. C: haem. strep., 7 cols.
Nov. 16	No discharge; no complaints	6 c.cm. of sx. cr.	S: few pus cells; few gram-pos. cocci. C: haem. strep., 11 cols.
CASE 6 Oct. 26, 1942	Perforating wound, lt. thigh; loss of fair amount of tissue	Sulphonamide and soft-paraffin gauze	..
Nov. 3	Entry wound on inside of thigh; great loss of skin, but not heavily infected; exit wound about 12 in. sq., fairly deep. Drains in position; exuding yellow pus; fairly foul-smelling	20 c.cm. of sx. cr. put on wound: 5 c.cm. on entry, 15 c.cm. on exit	S: pus cells + + +; mod. nos. gram-pos. cocci. C: *Staph. aureus*, mod. growth
Nov. 4	Blood conc.: nil	..	..
Nov. 5	Little discharge; tissue looked healthy; granulation. Pt. looked and felt fit	15 c.cm. of sx. cr. on wound	S: pus cells + + +; few gram-neg. bacilli. C: sterile
Nov. 8	Drain removed on Nov. 7. Wound healthy; much granulation; no discharge. Pt. v. fit	Same	S: pus cells +; few gram-neg. bacilli. C: sterile
Nov. 9	Blood conc.: nil	..	..
Nov. 11	No discharge; tissue healthy. Pt. had use of leg except for straightening out	Same	S: scanty pus cells, few gram-neg. bacilli. C: coliform bacillus, a few cols.
Nov. 12	Blood conc.: nil	..	..
Nov. 19	2 dry dressings since last treated; wound clean, ready for surgical treatment	..	..
CASE 7	Admitted Oct. 15 with cellulitis, rt. forearm and elbow. Large abscess, forearm; adenitis + + +	Sulphonamide powder and soft-paraffin gauze, Oct. 19–22. Abscess opened, Oct. 31. Oral sulphonamide, Oct. 15–Nov. 2	..
Nov. 6, 1942	Sl. discharge from both areas; ulcer resisted treatment	5 c.cm. sx. cr. to forearm	S: pus cells + + +; gram-pos. cocci in clumps + +. C: haem. *Strep. aureus*, free growth
Nov. 8	No discharge; beginning of granulation; both wounds clean	5 c.cm. to each wound	S: few pus cells; few gram-pos. cocci. C: *Staph. aureus*, mod. growth
Nov. 9	Bl. conc.: nil	..	..
Nov. 12	Forearm wound scarred over; elbow wound clean, but not covering over, probably owing to movement	5 c.cm. of sx. cr. to elbow	S: pus cells +; no orgs. seen. C: sterile
Nov. 18	Elbow wound beginning to heal; no discharge	2·5 g. of sx. p.	Nil abnormal
CASE 8 Oct. 26, 1942	Infected 2nd degree diesel-oil burn of lt. ankle with small 3rd degree area	'Tannafax' applied within 20 min., then eusol for 2 days	..
Nov. 2	Burn 9½ by 4¼ in., dirty and neglected	Cleaned; sx. cr. 30 c.cm. of 20% soln. (6 g.)	S: pus cells + + +; large nos. gram-pos. cocci. C: haem. strep. *Staph. albus.*
Nov. 3	Blood conc.: nil in 10 hr.; 0·2 mg. in 14 hr.	..	..
Nov. 8	Dressing removed. Only one small area of 3rd degree burn not healing. Remainder covering with skin.	Sx. cr., 20 c.cm. of soln. (4 g.)	S: pus cells + + +; few gram-pos. cocci. C: *Staph. albus*, a few cols.
Nov. 9	Bl. conc.: nil	..	..
Nov. 12	Wound clean; epithelium covering burn. All 2nd degree areas covered. Small pocket of pus around hair follicle	Sx. cr. 10 c.cm. of soln. (2 g.)	S: skin, pus cells +, no orgs.; follicle, pus cells + +, gram-pos. cocci. C: no growth
Nov. 13	Bl. conc.: nil	..	..
Nov. 18	Completely healed	Dry dressing only	..

SUMMARY (Parts I and II)

Treatment of infected war wounds with the calcium or sodium salts of penicillin rapidly reduced the numbers of gram-positive organisms, including clostridia, staphylococci, streptococci, and corynebacteria. Gram-negative organisms were unaffected. Therapeutic results were excellent.

Experiments with *Penicillium notatum* culture filtrates were promising.

In applying powdered sulphonamides to large absorb-

ing surfaces such as burns, wounds or the peritoneum, there is danger of producing an excessive concentration of the drug in the blood. The more soluble sulphonamides are therefore unsuitable for this purpose.

Experiments showed that plasma and other wound fluids break down succinyl sulphathiazole into free sulphathiazole; but the rate of breakdown is so slow that there is no risk of sulphathiazole being absorbed into the blood in dangerous quantities.

Local application of a lanoline cream containing 20% succinyl sulphathiazole quickly controlled wound infections by gram-positive organisms. No toxic or irritant effects were observed, and the blood contained less than 1 mg. of sulphathiazole per 100 c.cm. This lanoline cream is not recommended for intraperitoneal use.

The surface of wounds should be disturbed as little as possible. Aspiration of pus and the use of many-tailed bandages are recommended.

Attention to the mental state, general comfort, and especially the diet, is an essential part of the treatment of wounds.

These investigations were carried out in the Central Pathological Laboratory, MEF, by the staffs of that laboratory and of the laboratory of the Scottish General Hospital. The post-mortem examinations were carried out by Capt. A. D. Morgan, RAMC. The bacteriological controls were made in collaboration with Sergeant J. Pilling, RAMC, Sergeant L. C. Wilson, RAMC and Private H. Rosenband-Pollack, Palestine ATS.

We wish to thank Colonel H. D. F. Brand, RAMC, commanding the Scottish General Hospital, and the surgical staff of that hospital and its attached units, and in particular Colonel J. S. K. Boyd, RAMC, DDP, MEF, under whose general direction the investigations were made.

EXPERIMENTAL ALLOXAN DIABETES IN THE RAT

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IN 1889 v. Mering and Minkowski demonstrated that total pancreatectomy caused fatal diabetes mellitus in dogs. Their work has led to a great increase in our knowledge of diabetes, partly by promoting more intensive study of glycosuria, partly by directing the morbid histologist to more intimate investigation of the pancreas, but with most practical outcome by initiating the investigations which culminated in the discovery of insulin by Banting and Best (1921). Nevertheless, the classical experiment of over fifty years ago has had little or no influence on the doctrine of the ætiology of diabetes or on its prevention. Joslin (1937), in discussing prevention, refers almost solely to measures calculated to avoid hereditary transmission, and to care in dietary such as will lessen the likelihood of obesity. The value of these practical suggestions need not be doubted, for they refer to recognisable ætiological factors; but it is not claimed that they are based on exact knowledge of the pathogenesis of diabetes or of the part that may be played by disease of the pancreas in initiating the malady.

In recent years the work which has shown most promise for elucidation of pathogenesis is that of F. G. Young (1937) who discovered that diabetes could be produced in dogs by repeated injections of an extract of the anterior pituitary. Early in the course of the injections definite histological changes could be recognised in the pancreatic islets (Richardson and Young 1938, Richardson 1940). Later, when diabetes had been established for many weeks, the islets were permanently altered. In one case there was profound reduction of β-cells and in another extensive hyalinisation of islets with loss of almost all the specific cells; in this second case there was also a subacute pancreatitis affecting the acinar tissue. This research showed that a diabetic state can be produced by the action of a derivative of body tissue, and there may be deeper significance in the fact that the extract is derived from a gland concerned in the fine adjustment of normal nutrition. Also the histological results suggest that while the effective inoculum is obtained from the hypophysis it acts by influencing the islets of Langerhans.

In a previous paper (Dunn, McLetchie and Sheehan 1943) it was shown that selective necrosis of the pancreatic islets could be produced acutely in rabbits by pure chemicals, particularly alloxan. The first successful results in the production of diabetes with alloxan have since been obtained in rats.

The rats were albinos of a pure Wistar strain, and young adult males were used. They were ordinarily fed on hospital kitchen scraps consisting of potato, egg, meat, fats, and milk puddings. Animals which developed polyuria were supplied with abundant water. On this diet rats normally passed only about 5 c.cm. of urine daily, free from glucose. In earlier experiments the urine was collected on filter-paper in drops exuded when the animal was stretched. Such samples could be tested qualitatively for sugar by Benedict's reagent. In later experiments metabolism cages were available for collection of urine.

ACUTE EFFECTS OF ALLOXAN

The acute effects were examined in seven rats. One (No. 1) was injected intramuscularly and five (Nos. 2, 4, 9, 10, 12) subcutaneously with alloxan equivalent to 300 mg. per kg. body-weight; one (No. 11) received 400 mg./kg. subcutaneously. The clinical and the pathological effects varied. No. 10 showed no evidence of upset and when it was killed on the 4th day the pancreatic islets were normal; No. 4, though ill and off its food, also gave a negative histological result when killed at 48 hrs. In the other five animals well-marked lesions were found.

Nos. 1 and 2, hunched up and weakly, were killed at 6 hours. In both, the islets were universally affected: a large proportion of the cells throughout each islet were shrunken, rounded off and displaced from their attachments: their protoplasm was eosinophil and hyaline, and their nuclei pyknotic: a few cells among these retained normal characters (fig. 2). Two islets in the pancreas of No. 2 were of peculiar structure in having a wide peripheral cuff of large cells free from necrosis and with abundant eosinophil granular protoplasm and large active nuclei. These were judged to be α-cells, restricted to these two islets and surrounding a central mass of β-cells, many of which were necrotic (fig. 3).

No. 9 was ill and did not eat until the second day; glucose and insulin were given; there was glycosuria on the third day. When it was killed on this day the islets showed extensive lesions of later date than in Nos. 1 and 2. Many cells were crumbling to debris, others were loose and rounded off with pyknotic nuclei, and in a state from which recovery appeared doubtful: in contrast a proportion of cells remained in live state with normal or active nuclei; these had normal attachment to stroma and sometimes occurred in short ribbons. At the periphery of the islets there were numerous cells with small bodies and active nuclei; mitoses were very rarely observed.

No. 11 died, cold and drowsy, at 48 hours; there was no glycosuria. The changes in the islets were as in No. 9 but more severe, with more necrotic debris and more cells of doubtful viability, while obviously live cells were fewer. There were, in addition, very pronounced lesions in the small ducts in this pancreas, comprising dilatation and accumulation of wax-like eosinophil masses with leucocyte infiltration in the walls and in the interstitial septa: this lesion could be interpreted as an early pancreatitis.

No. 12 stopped eating on the second day and was hunched up and cold. Injections of glucose were given with insulin and the animal survived until the 4th day when death occurred in coma. The blood-sugar was then found to be only 0·01 g. per 100 c.cm. In the islets in this case most of the cells were normal and in situ, but scattered among these were a number of cells with shrivelled bodies and pyknotic nuclei, while granular debris of broken-down cells occurred here and there.

These few experiments, though they were only first trials, showed that in the rat as in the rabbit the pancreatic islets could be selectively and sometimes severely damaged by alloxan: the β-cells appeared to be chiefly if not exclusively affected. As compared with the lesions described in the rabbit, the necrosis tended to involve individual cells distributed through the islet rather than to destroy completely a central mass of

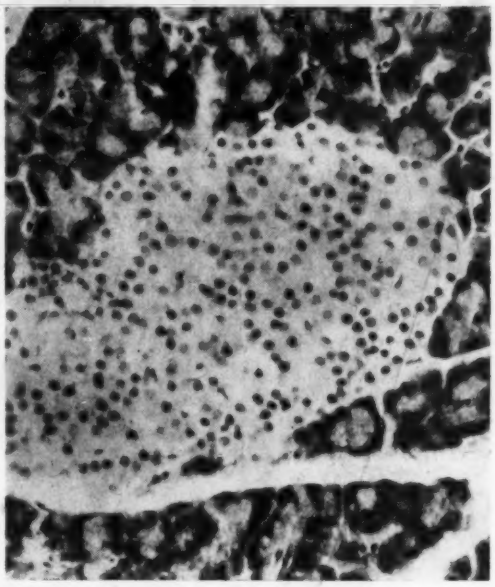

Fig. 1—Normal islet of rat. (x 350.)

Fig. 2—Islet from rat No. 1 showing extensive early necrosis of cells: a few ribbons of live cells survive at the top. (x 350.)

cells. In No. 4 at four days the lesion was clearly in a healing stage.

PRODUCTION OF DIABETES

A continuing glycosuria was established in five rats by a series of injections given in a tentative fashion until success was achieved. In most cases injections of glucose or glucose with insulin were administered from time to time because it was thought that early fatalities were due to hypoglycæmia. The methods employed are not necessarily the best that could be devised.

The doses administered subcutaneously, in mg./kg. body-weight, were:

Nos. 3 and 5.—300 (1st day), 25 (6th and 7th), 150 (8th), 100 (9th), 200 (10th, 19th and 20th), 150 (21st), 200 (23rd and 24th) and 400 (27th). Total 2·15 g./kg. in 27 days.

Nos. 6 and 7.—300 (1st day), 50 (6th and 7th), 150 (8th), 100 (9th), 200 (10th). Total 0·85 g./kg. in 10 days.

No. 13.—300 (1st day), 200 (16th), 300 (27th). Total 0·8 g./kg. in 27 days.

The effects observed were as follows:

No. 3.—From the 1st to the 20th day this animal appeared to be slightly out of condition and its weight fell from 290 g. to 250. On the 21st day, for the first time, drops of urine reduced Benedict's solution and this continued for a week without increase of urinary volume above normal. Polyuria, 15–20 c.cm., developed on the 28th day and continued, while glycosuria increased, reaching 4%. During this time the rat ate about twice the usual amount of food. A mass of solid fat was given and eaten on one day and the urine the next day gave a weakly positive Rothera reaction. From the 30th to the 35th day two units of protamine-zinc insulin was injected daily. The volume of urine and its sugar content gradually diminished and on the 35th day the urine was sugar-free; the insulin was then discontinued and polyuria (25-35 c.cm.) with glycosuria (3·9–4·5%) returned. The body-weight, which had been stabilised at 240–250 g. by insulin, fell to 210 g. by the 38th day. The animal, previously active, became lethargic and hyperpnœic. Albuminuria, which had been slight, increased to a heavy cloud. Acetonuria appeared on the 42nd day. The animal was killed on the 45th day: at death the blood-sugar was 0·382 g./100 c.cm.

Post mortem, large chronic abscesses were present in the lungs. The kidneys, enlarged and pale, showed a healed tubular nephritis with moderate permanent dilatation of many of the lower tubule segments. The adrenals were slightly enlarged. The pancreas was outwardly normal, but there was an extreme reduction in the number of islets. In sections from 23 blocks of pancreas only nine small islets were found: similar sections from the pancreas of a normal rat each contain from one to four islets of 100 × 150μ diameter and occasionally a very large one of 450 × 225μ (cf. fig. 3). Some of the islets in this diabetic pancreas were, though diminutive, of fairly normal structure: in others the cells were very irregular in size and abnormal in arrangement. Some of the cells, especially central in the islets, were swollen and rounded and exhibited varying degrees of pallor in staining of protoplasm, but without vacuolation. The peripheral cells were usually much smaller than normal, and had hyperchromatic nuclei.

No. 5 ran a course similar to No. 3, developing glycosuria on the 11th day; but it behaved with normal activity during the period of the injections. From the 27th day, when the injections ceased, it ate and drank excessively. Unlike a normal rat, it slept very little by day but continued eating or nosing at food: about four times the normal amount of food was consumed, while the daily intake of water was 50 to 80 c.cm. ($\frac{1}{4}$ to $\frac{1}{2}$ of the body-weight). There was a continuous polyuria of 35–70 c.cm. with 3·5 to 7% of glucose. From the 40th day there was acetonuria even without feeding of fat, and this increased markedly so that when diluted ten times the urine still gave a positive result even with ferric chloride. The urine had a faint cloud of albumin but in spite of polyuria the urea concentration continued at about 1·5%. By voracious eating this animal just managed to keep its weight steady at 200 to 220 g., but from the 52nd day a rapid deterioration set in. He ate less and became emaciated; his coat was lax and his eyes sunken and yellowish. An attempt was made to save him by repeated small doses of glucose and insulin, without result. The blood-sugar twelve hours before death was found to be 0·6 g./100 c.cm. in spite of the insulin. Death occurred on the 53rd day.

The findings in the pancreas were simple, in that no islet tissue could be found, while the acinar tissue was undisturbed. There were small areas of atrophy and others of dilated tubules in the kidneys, but the greater part of the renal parenchyma was normal.

No. 7 developed polyuria with glycosuria on the 12th day, increasing till the 19th when the output was 40 c.cm. with 4% of glucose. Albumin was also present. Injections of protamine-zinc insulin were commenced and carried on with gradual increase up to three units per day. On the 35th day the urine was sugar-free. Insulin was discontinued and polyuria and glycosuria returned (35 c.cm. with 4·8% glucose). The rat ate excessively but irregularly and was inclined to

Fig. 3—Large islet from rat No. 2 showing necrosis of central cells and peripheral zone of hypertrophic α-cells. (x 175.)

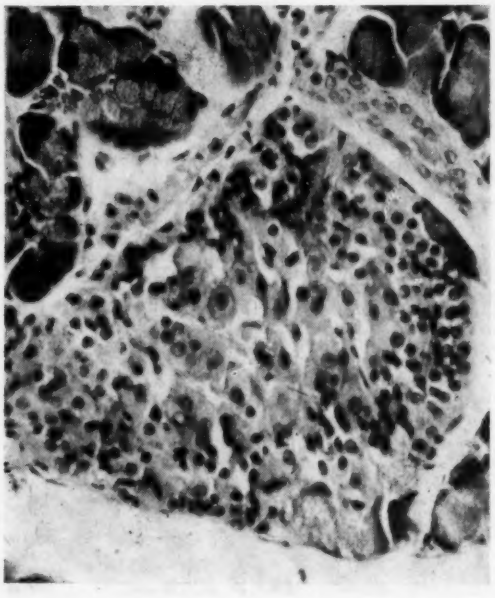

Fig. 4—Islet from diabetic rat No. 7. The cells are disordered in arrangement, the central ones being enlarged and the peripheral ones smaller than normal. (x 350.)

drowsiness. In the period following, though glycosuria was never absent, the animal's condition improved and it gained weight. Albuminuria disappeared. It was in good condition when killed on the 70th day. At this time the blood-sugar was 0·18 g./100 c.cm.

In the pancreas of this animal the islets were not clearly diminished in number, and many were of fairly large size, so that it would be hard to say that there was quantitative reduction of islet tissue. The islets themselves were abnormal in structure: the central cells were mostly large and polygonal or rounded, and were not arranged in natural ribbons or trabeculæ: their protoplasm was sometimes pale, almost vacuolated. At the periphery of the islets the cells had abnormally small bodies, so that the nuclei appeared closely packed (fig. 4). The general appearances as compared with the normal (fig. 1) suggested reparative change following upon damage of cells.

No. 6, dosed similarly to No. 7, developed glycosuria at the same time and was killed three days later, on the 14th day. Its weight had fallen from 240 to 185 g. The pancreatic islets were abundant and cellular, and no necrotic cells were seen in them. The arrangement of their cells was frequently disturbed and there was lack of uniformity in size, while some of the larger cells showed pallor in staining of protoplasm with diminished granularity but without vacuolation. These changes appeared to be reparative and to be residua of earlier acute lesions now practically healed.

No. 13.—This rat developed persistent glycosuria on the day after the first injection of alloxan. It showed no sign of illness and continued to feed well and to increase in weight. The second and the third injections caused no alteration of signs or symptoms and the urinary volume throughout remained about normal. From the 37th day the glycosuria diminished, and by the 39th it had disappeared, remaining in abeyance until the animal was killed on the 42nd day. In this case the amount of islet tissue in the pancreas appeared to be little short of normal, but there was definite evidence of old damage. Some of the larger islets, normally sharply oval, were partially collapsed and distorted in shape. Most of the islets were of fairly normal structure, but there was irregularity in size and shape of their cells, the central ones being larger and the peripheral ones smaller than normal. In three places a small irregular space, empty but for a few fibrillar strands and one or two capillaries, was observed among acinar tissue: these appearances, never seen in the pancreas of the normal rat, were thought to represent the sites of islets which had been destroyed in the acute phase.

DISCUSSION

The acute experiments show that alloxan produces specific damage of the islets of Langerhans in the rat, just as it does in the rabbit. In rats, after single subcutaneous or intramuscular doses, the destruction of islet cells has been less complete than in rabbits dosed intravenously (Dunn et al. 1943). The effects, however, vary in individual animals and it is probable that complete destruction of some islets can occur in the acute phase. The few observations that we have made on blood-sugar changes confirm the development of hypoglycæmia just as happens in the rabbit.

It is clear that most other tissues of the body, including as a rule the exocrine pancreatic tissue, are little if at all affected. No alterations have been recognised macroscopically or microscopically in liver, thyroid, thymus or pituitary. Sometimes in the acute phase there has been some congestion of the suprarenals, but microscopy has revealed no substantial cellular changes. The only other organs which have sometimes been seriously affected have been the kidneys. In some rats there has been fairly extensive necrosis of tubules, possibly determined by concentration in them of alloxan or one of its products to a toxic level. Where this renal lesion is severe it may contribute seriously to the illness of the acute phase. On the other hand, it can be very slight at the early stage, and the later experiments show that where it has occurred healing takes place. Hence it is probably of little account in the diabetic phase, and adaptation of experimental procedure may make it possible to damage the islets without damaging the kidney.

The course of events in the rats described as diabetic realises to some extent the theoretical probability that one form of diabetes should ensue upon extensive damage of the pancreatic islets. In our attempt to produce glycosuria there were no failures: the five rats mentioned, and one other not reported because of a rather complicated history, represent the whole batch that were put to this test.

The severity of the disease varied. No. 13 though glycosuric from the start, showed almost no other sign of diabetes and had apparently recovered completely in a month. No. 7 had a more severe illness with polyuria and polyphagia, but had almost recovered in 70 days. Nos. 3 and 5 were very different, for glycosuria, polyuria, polyphagia and polydipsia were outstanding features

easily observed at almost any moment of the day or night for long periods. No. 5 ended up characteristically with severe acetonuria, emaciation and coma, while the blood-sugar had risen to at least 0·6 g./100 c.cm. No. 3 would almost certainly have died shortly in the same way had it not been sacrificed.

The essential fact that the glycosuria could be abolished by injections of insulin, recurring after their discontinuance, was established in two experiments, Nos. 3 and 7. This in conjunction with the islet lesions seems to prove that the glycosuria was due to lack of insulin; but unfortunately systematic observations on the blood-sugar could not be carried out.

In all instances abnormality was observed in pancreatic islets. In Nos. 6, 7 and 13 the changes, though definite, were comparatively mild and represented healed or healing stages with replacement of cells. In Nos. 3 and 5 on the other hand, proportionate to the severity of the symptoms, the islets had suffered complete disaster with little or no sign of attempts at repair. From these two experiments one fact emerges which may have significance for future interpretation of pancreatic changes in human diabetes—namely, that some islets may be destroyed leaving no trace. This was observed also in the rabbit as early as five days after a single dose of alloxan (Dunn et al. 1943). While the changes in the human pancreas in diabetes are very variable and the amount of islet tissue is notoriously difficult to assess, cases occur where there appears to be diminution in number of islets and there is nothing to indicate whether the islets have been deficient naturally or whether they have been in part destroyed. At this stage, however, there is no need to attempt any close comparison between the pancreatic lesions in this artificial disease produced by an acute onslaught in the course of a few weeks, and in human diabetes which from an insidious onset may have lasted for years. We have seen for example none of the more characteristic islet changes described in the human disease—sclerosis or hyalinisation of islets, or hydropic changes in their cells. The experiments are few and of comparatively short duration, and by more extensive investigations a wider range of pathological phenomena may be brought to view. The essential purpose of this paper is to show that the islets of Langerhans can be selectively damaged by a chemical substance conveyed to them by the humoral route, and that in consequence a lasting glycosuria can be established in animals which are maintained alive.

SUMMARY

Alloxan, in doses of the order of 300 to 400 mg. per kg. body-weight introduced subcutaneously or intramuscularly in rats, usually caused severe acute damage of the islets of Langerhans in the pancreas. In some cases, though not invariably, there was also necrosis in renal tubules.

In five rats which survived a series of doses, glycosuria developed. Two of these animals exhibited almost all the signs and symptoms of severe diabetes mellitus. A third had symptoms of moderate severity and appeared to be recovering after two months. The glycosuria could be abolished by injections of insulin. Pathological alterations of varying severity, but extreme in two cases, were found in the pancreatic islets in these diabetic rats.

We have much pleasure in acknowledging our indebtedness to Dr. E. Duffy for blood-sugar estimations, to Mr. J. Kirkpatrick for photomicrographs, and to the works department of the University of Glasgow for making metabolic cages at short notice. The work was supported by a grant from the Rankin medical research fund of the University of Glasgow, and continuation of it has received generous assistance from the Medical Research Council

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TUBERCULOSIS AT A CHILDREN'S HOSPITAL

AN ANALYSIS OF CASES

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THE following is an analysis of cases of tuberculous infection admitted to the Hospital for Sick Children, Great Ormond Street, during the first 6 months of 1942. The recent report of the Medical Research Council on tuberculosis emphasises the increase in the number of cases of infection in children under 5 years. This is borne out by the following figures which show how the pædiatricians are encountering the results of spread of tuberculous infection during the first years of the war. The return of active cases of phthisis from hospitals and sanatoria to homes where there were young children, the crowding and unhygienic conditions of shelter life during the blitz, and the evacuation of children to the country where they were exposed to the possibility of an infected milk-supply or to other unrecognised sources of infection, are among the factors which have led to the increase of tuberculosis in children. This analysis does not claim to raise any fresh points in the epidemiology of tuberculosis. It is an attempt to emphasise the seriousness of the position as regards childhood infection seen from the pædiatric standpoint.

The number of cases of tuberculosis relative to the total number of admissions for the first 6 months of the years 1938 and 1942 were as follows:

	Total admissions (medical and surgical)	Cases of tuberculosis	%
1938 ..	3552 ..	75 ..	2·11
1942 ..	2184 ..	65 ..	2·98

Owing to war-time conditions, very few beds were available at the hospital, so for 1942 (January to June) the total admissions to the two base hospitals and to Great Ormond Street were taken as being comparable to the admissions in 1938 (January to June). Cases of tuberculous infection in 1942 represented 2·98% of the total admissions as compared with 2·11% in 1938, being an increase of 41%.

TABLE I—DISTRIBUTION OF VARIOUS TYPES OF INFECTION

Type of infection	*1938*	*1942*
Miliary infection	9	15
Pulmonary infection— ..	12	23
Pleural effusion ..	3	8
Epituberculosis ..	..	4
Hilar enlargement ..	..	5
Unclassified	9	6
Abdominal infection ..	7	6
Bone infection—	22	7
Spine	10	5
Hip	8	1
Knee	2	1
Ankle	1	..
Dactylitis	1	..
Kidney	1	..
Cervical adenitis	24	14
—	75	65

In table I the distribution of cases between the various types of infection is analysed. The increase in the number of cases of miliary infection from 9 to 15 is remarkable, and there is also a definite increase in the number of cases of pulmonary infection, particularly of pleural effusions. The high incidence of bone infections in 1938 may be partly accounted for by the fact that many more chronic cases were admitted then that in 1942, where admissions were largely limited to acute cases.

In table II the cases admitted in 1942 are analysed further. Of the 65 cases, 15 were found to have miliary tuberculosis, 4 of them being over 4 years of age, the other 11 having an average age of 9 months. There were 2 babies of 3 months, both with a definite history of contact. Most of these babies with miliary infection were brought to hospital on account of general ill health

and failure to gain weight. A few cases gave a history of cough. Others, known to have been in contact with adult infection, were either sent by a private doctor or brought by anxious parents for radiological examination. A few cases were actually admitted on account of meningeal symptoms. One of the older children was a girl of 8 with chronic miliary infiltration of both lungs shown radiologically. She subsequently developed a pleural effusion, but was still alive 12 months after radiological

TABLE II—ANALYSIS OF CASES ADMITTED IN 1942

Type of disease	Cases	History of contact	Tuberculin reaction	
			Pos.	Neg.
Miliary	15	6	8	3
Pulmonary—	23	..	17	..
Pleural effusion	8	1	8	..
Epituberculosis	4	2	4	..
Hilar enlargement	5	1	5	..
Unclassified	6	..	..	..
Abdominal tuberculosis	6	..	6	..
Spinal caries	5	1	..	1
Hip	1	..	1	..
Knee	1	..	1	..
Cervical adenitis	14	..	3	..
—	65	11	36	4

diagnosis. The other 14 cases died within a few days or weeks of admission, all of them showing terminal meningeal involvement. Of these 15 cases, 8 gave a positive tuberculin reaction, 3 a definite negative reaction and in 4 cases the result is unfortunately not recorded; 6 cases gave a definite history of contact.

There were 23 cases of pulmonary involvement other than miliary infiltration. These were 8 cases of pleural effusion, one of which had erythema nodosum as the presenting symptom. The others gave a history of pain in the chest, cough and malaise after a "cold" or acute febrile attack. There were 4 cases of epituberculosis shown radiologically, the presenting symptom again being general ill health and cough following an acute fever or "cold"; 5 other cases, 2 of which showed erythema nodosum were found to have enlarged hilar shadows. There were 6 cases which are not classified, but they were almost certainly cases of epituberculosis. Of the 23 cases, 17 of which gave a positive tuberculin reaction, only 4 give a history of contact. Most of these pulmonary cases were referred for sanatorium treatment, a few with suitable homes were advised long convalescence with periodic observation, and removal from contact, if present.

Abdominal tuberculosis was present in 6; 5 were found to have distended abdomens with a palpable mass of glands, and omental involvement. The 6th presented symptoms of subacute obstruction, necessitating operation. All 6 cases showed a positive tuberculin reaction and none gave a history of contact; 1 gave a history of a questionable milk-supply. These cases were treated with long convalescence or sanatorium treatment and when last heard of were making good progress.

Only 6 cases of tuberculosis of bone were seen; 5 of these were cases of spinal caries. One gave a definite history of contact but showed a negative tuberculin reaction. They were all referred to an orthopædic centre for treatment. There were 2 cases of tuberculous arthritis, one of the hip and one of the knee. Both gave positive tuberculin reactions. Of 14 cases of tuberculous cervical adenitis, 3 tested for tuberculin reaction were all positive; the other 11 unfortunately were not tested, but the diagnosis rests on the opinion of an experienced observer and seems to have been borne out by the subsequent course of the disease. None of these cases gave a history of contact or of a questionable milk-supply.

Of the 65 cases 17% gave a definite history of contact. It is perhaps significant even in such a small series that 6 of these "positive contact" cases occurred in the group with miliary infection, 5 of them in children of under 15 months of age, a point which emphasises the serious results of infection in the early months of life.

I was struck in taking these histories by the ignorance of the parents of the risk of infection. A way should be found of educating the public in the danger of allowing young children to come in contact with cases of active tuberculosis. It is surprising how often the parents are unaware of the risk. A remote grandparent with phthisis, who died many years before the birth of the infected child is often cited, whereas the neighbour with a slight hæmoptysis who shared the air-raid shelter is ignored as a possible source of infection. Much could be done by education in tuberculosis dispensaries and health centres to enlighten the public about contact.

My thanks are due to the staff of the Hospital for Sick Children, Great Ormond Street, for access to the notes and permission to publish these cases.

Reviews of Books

Embryological Treatises of Fabricius

HOWARD B. ADELMANN. (Cornell University Press. Pp. 883. $12.)

Harvey constantly admitted his debt to the Italian anatomist, Hieronymus Fabricius of Acquapendente, whose demonstration of the valves in the veins, he said, led him to formulate his own conception of the circulation of the blood. It is difficult to award Fabricius his true status among his peers. He succeeded two great anatomists—Vesalius and Fallopius—in the chair at Padua and owed much to the tradition of the first and the patronage of the second. His writings were for the most part published late in his life, long after he had become famous for his lectures and demonstrations, which attracted to Padua students from all the European countries. Professor Adelmann whose labours on Fabricius are enshrined in this monumental volume, sets out brilliantly the state of knowledge in the sixteenth century, the position of the University of Padua as a centre of learning, and the life and manners, quarrels and controversies, of a man who whatever his standing in the eyes of posterity was certainly not lacking in self-appreciation. He has also translated and profusely annotated two of the treatises of Fabricius—on the formation of the egg and the chick and the formed fœtus. Copies of the original illustrations and a good index make this a memorable publication.

After-Care and Rehabilitation

Editors: Sir HUMPHRY ROLLESTON, Bt., MD CAMB., FRCP; ALAN MONCRIEFF, MD LOND., FRCP. (Eyre and Spottiswoode. Pp. 128. 8*s*. 6*d*.)

THIS ninth in the series of *Practitioner* booklets is a useful guide to problems of aftercare and rehabilitation in a very wide range of conditions. Postoperative care is discussed from the medical, surgical, anæsthetic and psychological standpoints, and a series of articles deal with rehabilitation in acute medical diseases and pulmonary tuberculosis. A vigorous chapter by Dr. Geoffrey Evans is full of sound practical advice on measures for preserving general body function in patients confined to bed. The special problems of surgery—head injuries, fractures and amputations—are covered by recognised authorities clearly and concisely, and there is a final chapter on occupational therapy. The booklet is an authoritative and practical review of a topical subject.

The Metabolism of Fat

IDA SMEDLEY-MACLEAN, MA, D SC, FIC, biochemical department of the Lister Institute of Preventive Medicine. (Methuen. Pp. 104. 5*s*.)

THE author of this little book is an acknowledged expert in the subject, and it is a pleasure to read her simple but lucid account of the way the fats are broken down, synthesised and oxidised in living organisms. The constitution of the lipins and the absorption and transport of fat and fatty acids also receive attention. The text is clarified by an abundance of structural formulæ. Within the space at disposal no-one could have treated the subject in an exhaustive way, but she has made up for this by giving a list of references covering every chapter, not only to the latest publication in English but to the best of the papers in all languages during the last 40 years. Teachers and advanced students will find this little book very useful, and biochemists and physiologists could do with a great many more of its kind.

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[1] *J. Amer. med. Assoc.* (1941) 117, 1496.

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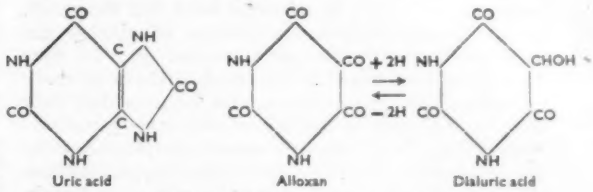
THE LANCET

LONDON: SATURDAY, SEPTEMBER 25, 1943

EXPERIMENTAL DIABETES

ALTHOUGH it is 42 years since OPIE localised in the islets of Langerhans the pathological changes associated with diabetes mellitus we are still far from understanding the origin of the degenerative changes that may lead to this disease. In 1922 ALLEN [1] found that dogs deprived of a large part of their pancreas might remain non-diabetic while on a diet low in carbohydrate, but sometimes developed fulminating diabetes when more carbohydrate was added to their food. Such a diabetic condition was associated with changes in the islets, the most striking of which was hydropic degeneration, and ALLEN believed that this was demonstrable in the human pancreas whenever the diabetic symptoms had been intense and prolonged. Others have observed it only rarely, but according to ALLEN this is because their cases were mild or because post-mortem changes made identification difficult. More recent work [2-5] has shown that in animals rendered diabetic by administration of anterior pituitary extract the chief early changes in the islets are degranulation of beta cells, with hydropic degeneration in some of these cells, and mitotic activity in some islets. Later the principal abnormalities are beta-cell degranulation, reduction of islets to small groups of alpha cells, and gross hyalinisation of the islets; in some instances [3] the beta cells seem to be selectively replaced by hyaline material. Hyaline changes are now generally considered to be the most characteristic pancreatic lesion in human diabetes mellitus [6] and the state of the islets in animals with long-standing diabetes induced by a short series of pituitary injections may be regarded as analogous with that in human diabetes.

In the past few months SHAW DUNN and his colleagues [7 8] have shown that intravenous administration of alloxan to rabbits can cause acute necrosis of almost all the islet tissue of the pancreas. A single injection is followed by an initial rise in blood-sugar level, giving way to a profound fall which sometimes ends fatally; and subsequently almost all the islets are found to have undergone necrotic changes. In our present issue SHAW DUNN and MCLETCHIE provide the logical sequel to these observations by showing that when islet lesions are induced in the rat by giving a series of injections of alloxan the animal develops hyperglycæmia, glycosuria, and often the cardinal symptoms of a persistent and severe diabetes mellitus. These findings are obviously of great importance; but it must be confessed that their physiological significance is not yet clear. Alloxan is a simple condensation product of urea and mesoxalic acid, and is commonly prepared in the laboratory by the oxidation of uric acid with strong oxidising agents such as dilute nitric acid :—



Alloxan is easily reduced to dialuric acid, which can itself be oxidised to alloxan, and at one time it was thought that such a pair of compounds might provide a biological oxidation-reduction system. Although this remains to be proved, it is perhaps noteworthy that the easily reduced and biologically important substance riboflavin is a complex derivative of alloxan. The hypoglycæmic action of alloxan was reported by JACOBS [9] in 1937, but apparently he did not examine pancreatic tissue from the rabbits he treated, and the Glasgow discovery that alloxan affects the islets was wholly unexpected. The observation was made in the course of an investigation of the pathogenesis of the crush syndrome: alloxan was tested for its action on the kidney because it was deemed to be a possible biological oxidation product of uric acid, and recognition of its action on the islets of Langerhans followed the finding that rabbits sometimes died in convulsions a few hours after receiving a single intravenous injection.

In SHAW DUNN'S animals we have the first example of a diabetic condition in which the death of the islet cell can be observed, so to speak, on the table. The rapidity with which a selective necrosis can take place is one of the most striking facts now brought out. Taking into account the hypoglycæmic phase, SHAW DUNN and his colleagues suggest that alloxan stimulates islet activity, and that the cells finally fail and undergo necrosis because they have been overdriven. They discuss the possibility that alloxan may be formed in the body under physiological conditions, and act as a muscle hormone in regulating islet activity, and they refer to it as a possible cause of an initial disturbance of the islet system which may eventuate in diabetes mellitus. But it is perhaps unnecessary to assume a physiological stimulation of the insulin secretory mechanism in order to explain the observed facts, and the importance of the new observations does not depend on the validity of such speculations, interesting though they are. Certainly the histological picture of the islets is very different from that of the pancreatic remnant in ALLEN'S partially depancreatised dogs, in which the degenerative changes were attributed by ALLEN to overstimulation, a conclusion recently supported by BEST.[10] The hydropic degeneration and degranulation in the beta cells which follow administration of diabetogenic pituitary extract to dogs are likewise ascribed by BEST and his colleagues [11] to overwork, but HOUSSAY'S team [12] concludes that the pituitary extract directly induces degenerative changes in the islets, and that hyperglycæmia produced by other means aggravates the lesions arising from this direct

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action. Most other workers have assumed that the islet damage is more likely to result from overstrain due to a high blood-sugar level, but HOUSSAY, by continuous intravenous infusion of glucose has maintained the blood-sugar of normal dogs for four days at the level found in dogs made diabetic by daily injection of pituitary extract, and he says that their islets showed none of the lesions seen in the pituitary-treated dogs; the beta cells were hyperplastic rather than degenerate and there were signs of hyperfunction. He concludes that the pituitary extract must have a direct action on the islet cells which is not mediated by hyperglycæmia. The nature of such an action is not at all clear, but the observations of SHAW DUNN on the extraordinary action of the simple substance alloxan may well offer a new approach to this problem, and ultimately to the problem of the genesis of human diabetes mellitus.

WHAT MONEY CAN BUY

"Do you consider that a patient's financial status should have any bearing on the treatment available?" This rather awkward question is one of eight put to the inhabitants of Eastbourne by the local branch of the BMA. The answer, on the face of it, is No. If Parliament decides on a national medical service, financed by compulsory contributions and taxation, that service, one would say, cannot possibly offer an inferior kind of medical care to citizens who happen to be poor, or a superior kind to those who happen to be rich. In any national service the governing principle must surely be "To each according to his needs" without regard to his capacity to pay. Nevertheless the object of the new service is to improve the care of the majority, not to make things worse for the minority—to level up, not to level down. To provide precisely similar care for everyone would mean that some people got much less attention than they now command. In our last issue Dr. W. N. LEAK denounced as medically unsound the idea that all can be treated alike. "Can you suggest any reason," he wrote, "why those who are accustomed to a higher and more comfortable standard of living should have their time of sickness made into a time of acute physical and mental discomfort as well?" Most of us will agree that a medical Utopia will not be built by forcing Lady A from Belgravia into a bed next Mrs. B from Pimlico; though it would doubtless be good for both if the position could be achieved voluntarily. If then we accept the anomalies of the social structure as we find them, does this mean that financial status should after all have a bearing on treatment—that a superior kind of medical care should be sold to those who can afford it?

Earlier this year, discussing Privileges in Hospital, we expressed the opinion that, at least for a transitional period, extra comforts should be purchasable in hospital, so long as this is not to the detriment of the purchaser or his fellow patients. Thus the well-to-do should be allowed to rent private rooms attached to hospital wards, provided these rooms are not wanted by others with a *medical* claim to privacy. (This claim must be strictly enforced; in the past medical need has been by no means as sure a passport to privacy as is money to pay.) Hospitals belonging to a national service will presumably remain free to erect private wings where those who wish it can be accommodated either in return for a weekly rent or as contributors to a voluntary saving scheme. Two conditions, however, are important. First, the existence or prospect of pay-beds must not prejudice improvement in the ordinary wards of the hospitals. Secondly, contributory schemes covering extras such as private accommodation must not be extended to cover essentials of any kind. In a comprehensive service all the essentials will be paid for by compulsory contributions or taxes: the sick person will have a right to all necessary hospital treatment without extra payments or contributions to other funds. It is true that Sir WILLIAM BEVERIDGE proposed that hospitals should be entitled to charge him a "hotel fee" of about 10*s*. a week; but this is merely to remove the part of the sickness benefit that would otherwise be spent at home. It may be that the voluntary hospitals will seek to convert the hotel fee, which is simply intended to prevent patients from making a profit out of social insurance, into a real maintenance charge, either to augment their incomes directly or to justify their continuing their contributory schemes. But any such arrangement must be resisted, for it would destroy one of the main principles of the Beveridge plan. The sick person, called upon to pay perhaps half or three-quarters of his insurance money in return for hospital treatment, would no longer be free from want, and all the financial anxiety associated with sickness would return. If ordinary hospital saving schemes go on, the whole conception of a single all-embracing insurance contribution will have been lost. In a comprehensive service the only legitimate function of saving schemes is to supply extras.

Privacy is not the only advantage at present enjoyed by the affluent when they fall ill. Besides private rooms, money can buy doctors' time in almost any quantity, and people accustomed to this privilege will naturally resent any attempt to ration medical attention. To meet this difficulty it has been suggested that patients who think their ration inadequate shall be able to pay the family doctor or the specialist a fee for seeing them "after hours"; beyond the bare essentials that are their right they would be permitted to purchase extras in the form of further examination, leisurely heart-to-heart talks, and explanations at length to relatives. This proposal is objectionable if it implies that full examination and full explanation are not essentials of a complete service: in our view they are part of Basic Medicine and not extras at all. Similarly a second opinion, when necessary for the patient's peace of mind, is a normal part of medical care. It is only when the demands of patient or relatives become unreasonable that the question of payment should arise: here the consultation is truly an extra, and a fee might well be paid for it. Such a fee, however, ought not to be paid directly to the doctor who gives the additional attention: a national service should include no mechanism by which a patient pays his doctor privately; otherwise it will look as though money could really buy a superior kind of medical care. Today unfortunately the public tends to believe that doctors have two standards—one for the panel patient and another for the private patient who pays them fees directly. There may be little enough

justification for this belief, but it would be well if the structure of any new service gave it no chance to persist. Like lawyers, we must pursue not only justice but also the appearance of justice. Like lawyers, we have some way to go.

INTRAPERITONEAL SULPHONAMIDES

THE introduction of sulphonamides into the peritoneal cavity has become a recognised adjunct to abdominal surgery. The animal experiments and clinical experience of HUDSON and his colleagues [1] demonstrated the efficiency of intraperitoneal sulphanilamide in reducing mortality in early peritonitis, and established a workable technique. From the results in a controlled series they were satisfied that implanting the drug at operation was more effective than giving it by mouth or vein. Sulphanilamide is readily absorbed from the peritoneum, and a single implanted dose produces a therapeutically effective blood-concentration for a few hours only, but the concentration in the peritoneal exudate falls much more slowly [2]; thus it may be as high as 300–800 mg. per 100 c.cm. forty hours after operation. It is therefore possible by this route to maintain a very high local concentration of the drug without reaching a toxic level in the blood. But there is one hole in this argument; intraperitoneal sulphanilamide produces a concentration in the portal vein some 40% higher than in the blood-stream, and this probably explains the liability of large intraperitoneal dosage, supplemented by venous or oral administration, to produce hepatitis; thus JACKSON and COLLER [3] reported 9 cases of non-fatal jaundice in a series of 29 patients. So sulphonamides cannot be scattered about the abdominal contents regardless of dosage—if liver damage is to be avoided it is wise not to exceed a dose of 15 grammes.

Since the effect of intraperitoneal chemotherapy does not depend on the concentration attained in the blood, there is an obvious argument for using a compound less soluble than sulphanilamide—one which, being slowly absorbed, will maintain a high and long-lasting local concentration without raising the level beyond safety in the portal vein or blood-stream. Besides which, other compounds are more powerfully bacteriostatic and reach a wider range of organisms. Surgeons have therefore not been content to remain faithful to this one drug, though a MRC committee [4] still consider it the drug of choice. GARDINER [5] of Aylesbury uses sulphapyridine, and in spite of forebodings from other workers has had satisfactory results, with no trouble from adhesions, in 15 cases of perforated appendix given 10 g. of sulphapyridine intraperitoneally at operation. Others have used sulphathiazole and sulphadiazine, and in this issue PULVERTAFT describes animal experiments with the intraperitoneal insertion of sulphasuxidine. The new drug slowly breaks down into sulphathiazole, thus acting as a reservoir with no risk of producing a toxic blood-level. For clinical use PULVERTAFT recommends a microcrystalline form of sulphasuxidine. CRUTCHER and his colleagues [6] have contrasted the effect of these two drugs and sulphanilamide when introduced as a fine powder, a suspension or in lumps. In dogs the lumps often remained unchanged for days or even weeks and led to a local reaction similar to that from any foreign body—a lump of sulphathiazole was found in a mass of adhesions 37 days, and a lump of sulphadiazine 20 days after its introduction. Sulphanilamide disappeared rapidly in all dogs but one. The powder and suspension, besides being more thoroughly absorbed, produced much less local reaction and adhesions; in these respects sulphanilamide was the best and sulphadiazine the worst of the three. The drug, then, must be spread thinly, preferably in the form of a suspended powder or microcrystals; in lumps it may do more harm than good, and a fine dry powder is particularly apt to form lumps. Opinions differ on the question of adhesions, but chemotherapy will control infection, which with trauma is the main factor in producing them. The reported case of tetanus following intraperitoneal implantation of sulphapyridine reminds us that the sulphonamides are not antiseptics; in powder form they are not self-sterilising and can readily carry contamination from their containers or applicators. The difficulties of sterilisation have now been largely overcome—the MRC memo describes large-scale and small-scale methods—and only sterile preparations should be used within the peritoneum.

In the early days HUDSON and SMITH suggested that supplementary chemotherapy by mouth or injection might help to keep up the intraperitoneal concentration, and GILCHRIST and his co-workers [7] have confirmed this. A combination of routes should improve results in the more advanced cases of peritonitis and control the postoperative pulmonary and renal infections which an intraperitoneal dose does not check. It may be wise, however, to delay supplementary dosage for some hours after operation, in order to avoid a toxic concentration in the portal circulation. GILCHRIST suggests the following programme for perforation of the gut in a battle casualty:

> As a first-aid measure, 0·5 g. of sodium sulphathiazole per 10 lb. body-weight should be injected intravenously in a 5 or 10% solution. This injection should take from 2 to 4 minutes. Intravenous fluid, plasma or blood should follow. As an alternative, a soluble drug or a suspension of sulphathiazole microcrystals may be injected directly through the abdominal wall, or in some cases through the entry wound.
>
> As soon as possible, laparotomy should be performed. At that time a relatively insoluble sulphonamide, such as sulphathiazole, should be placed in the abdomen. When soluble sulphonamides are used in the abdomen, additional drugs must be administered after 8 hours. When slowly soluble sulphathiazole is used in the abdomen, no additional drugs are needed for 24 hours.

The need for fluids must not be forgotten—an intake of 4½–6 pints a day is essential—and the urine should be kept alkaline to litmus, if renal complications are to be avoided. If the dosage, form and sterility of the drug are correct, intraperitoneal chemotherapy will reduce operative mortality and complications, its greatest use being in the early case of peritonitis or as a prophylactic measure when the peritoneum is known to be contaminated. But reliance must not be placed on these drugs to the disregard of general surgical principles, such as drainage, intestinal decompression, replacement of fluid and prevention of cross-infection.

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Annotations

THE RCOG AND CONSULTANT STATUS

IT is now fourteen years since the youngest of our colleges began life modestly under the auspices of the Board of Trade. It has already proved its worth to the state, earned the royal status conferred on it in 1938, and but for the war would have by now received its charter. Although so young it claims wider responsibilities than its sister colleges, for it is representative of Scotland, Ireland and the Dominions as well as of England and Wales, and as a result today has a helpful finger in many plans. Sir William Fletcher Shaw, on the eve of retiring from the presidency which he has held since 1938, tells[1] how delegates from the RCOG sit on the BMA planning commission, on the representative committee which is discussing the Beveridge report with the Ministry of Health, and on the standing joint committee of the three Royal colleges through which suggestions for the training of consultants have been made. The principle that in the making of a consultant postgraduate resident training plays a part as important as examinations has now been generally accepted; that principle, he proudly remarks, was first laid down by his college, and he is anxious that in the immediate postwar period standards will not be lowered. There will be many vacancies for obstetricians and gynæcologists, but he urges the college, while arranging to train as many candidates as quickly as possible, to do so without sacrificing quality to the demand for quantity. It would be better, he feels, for districts which have managed up to the present without highly trained consultants to carry on a little longer, rather than to flood the country with half-trained men. Indeed in its report to the Goodenough Committee the college had affirmed its resolution as soon as possible after the war to increase its requirements for the MRCOG. A period of five years' postgraduate training was suggested as a condition of admission to the proposed register of consultants. But a man who had spent years with the Forces could hardly be expected to spend another five years of apprenticeship, and it was proposed that for the five years after the war obstetricians and gynæcologists should be accepted on the present MRCOG regulations provided that the period of service with the Forces added to the period of resident appointments made up five years altogether.

SUPPLY OF RADON

THE council of the Medical Defence Union in presenting its annual report on Tuesday felt obliged to reaffirm its conviction that the potency of radiotherapy is so great as to require skill of a high degree if unnecessary damage to normal tissues is to be avoided. The ugly lessons were probably drawn from experience of the rather lighthearted use of X rays for minor skin affections, which had resulted in burns and other tiresome reactions. Litigation in such cases is particularly harmful because it may lead the public to believe that painful reactions are always a sign of want of skill whereas they may be inevitable in the effective treatment of malignant disease. In another branch of radiotherapy the use of radon has, under war-time conditions, largely taken the place of radium element. Despite its innocent appearance radon carries with it the same risks as radium and in January last the National Radium Commission and the Medical Research Council decided on the conditions that should govern the issue of radon prepared from radium at the centres under their control. The same principles have now been accepted by the London Hospital Radon Service and that of the Manchester Radium Institute. The radon centres will supply radon only to hospitals which have been approved by the Radium Commission, and not direct to individual clinicians. The Radium Commission will in the first instance approve for supplies of radon only those hospitals which have a properly equipped radiotherapeutic department, with a radiotherapist and a physicist as part of the staff, and which have a properly organised follow-up of patients treated by radiotherapy. Such hospitals must undertake responsibility for seeing that the radon is properly used, with adequate precautions against wrong dosage. Where members of the staff of an approved hospital carry out some of their work at other hospitals not able to comply with these conditions, they may obtain supplies of radon through the approved hospitals provided the radiotherapist there is satisfied that the radon will be efficiently used. A list of the 49 hospitals so far approved (London 17, Provinces 24, Wales 3, Scotland 5) is given on p. 400. The supply of radon in the immediate future has been further assured by the generosity of the British War Relief Society of America in maintaining the radon centre at the Middlesex Hospital under the direction of Prof. Sidney Russ. The centre was opened in January, 1941, with a donation of £5000 and last week Mr. Clarke H. Minor, president of the American Society, handed a further cheque for £1500 to the chairman of the British Hospitals Association.

THE FATHER OF COMPARATIVE ANATOMY

EDWARD TYSON, born in Bristol of a long line of Bristol worthies, scholar of Oxford and of Cambridge, anatomist of London and Fellow of the Royal Society, has at long last been made a real character in a full-length biography. The life of Edward Tyson, late though it may be in its coming,[1] is a triumph of the biographer's art. The work displays special knowledge, patient research and real sympathy on the part of the biographer, as well as the best technique of modern book-making. It would be natural to ask whether some Bristol biographer, or perhaps an Oxford man interested in the distinguished scholars of Magdalen and the school of anatomy of Oxford, or maybe a student of the early days of the Royal Society or the College of Physicians and of the medical history of London had lovingly undertaken the task; and whether the work had been published by the University of Bristol, Oxford or Cambridge, or by the Royal Society or the College of Physicians. Actually, the biographer is associate professor of anatomy in the Hahnemann Medical College of Philadelphia and the volume is published by the American Philosophical Society. This is to our advantage, if not much to our credit, for even if some British anatomist had possessed the special knowledge and the leisure to undertake the task he would have sought in vain for a British learned society with adequate resources to produce this valuable addition to the history of British biological science. A generation of medical men who studied anatomy before the Berlin Anatomical Society had decreed eponymous nomenclature to be unscientific and British anatomists had meekly bowed to that decree, knew Tyson as a name and had some vague idea as to his period and nationality. They knew him as the discoverer of the glands then known by his name—glands that, strangely enough, he never himself described in any publication. Some knew him as the author who had described the "pygmie" and some knew that his description was, in fact, the first detailed account of the anatomy of an anthropoid ape. But few recognised him as "the Father of Comparative Anatomy in England and also the greatest of England's comparative anatomists, and among the greatest of all time anywhere" as Ashley Montagu declares him to have been. The picture he has painted of the man and his works suggests that this estimate is a just one. Edward

1. Report for 1942 of the council of the Royal College of Obstetricians and Gynæcologists: from the secretary, 58, Queen Anne Street, London, W.1.

1. Edward Tyson, MD, FRS. 1650–1708. M. F. Ashley Montagu. American Philosophical Society. Pp. 488. $5.

Tyson was born on Jan. 20, 1650; it may be that one of the British institutions to which Tyson's association brought vicarious renown will make some recognition of the 300th anniversary of his birth, when the time comes.

A FILM WORTH SEEING

EVEN ten years ago a diagnosis of cancer of the lung was a death warrant. The fact that selected cases can now be saved by operation is at present of more academic than general importance; for it is a feat of surgery which few have so far achieved. A film of such an operation, made by the film committee of the British Council, displays the technique in a way, and through a medium, which will inform a wide medical audience of the possibilities of the method; and this, in the long run, will mean a greater chance of successful operation for the patient with carcinoma of the lung.

On Sept. 14 this film—"Surgery in Chest Disease"—was shown to a medical audience at the Curzon Cinema, London. The photography and the illustrative diagrams were exceptionally good, and the story of the patient was told without sentimentalism—no mean feat. The sequence showing the exposure of the hilum, the dissection and division, in turn, of the pulmonary artery, the superior pulmonary vein, the bronchus and the inferior pulmonary vein, and finally the closure of the bronchus showed the skilful technique clearly; indeed, the assistant at the surgeon's elbow could not have seen the detail as well as the audience in the Curzon Cinema.

The film is the first of a series of medical films to be made by the council; they are intended primarily for overseas medical audiences. Surgeon Rear-Admiral Gordon-Taylor, who introduced the film mentioned some of the other activities of the medical panel of the science committee of the British Council. Besides publishing a monthly bulletin in four languages, and giving representative medical books and journals to overseas scientific institutions, they award scholarships to young medical workers from abroad who wish to study in Britain and arrange lecture tours abroad by British experts.

SHORTAGE OF DOCTORS IN UNITED STATES

BY the end of this year about 53,000 medical officers will be serving with the US armed forces. For the rest of the population, roughly 120 million, it is estimated that about 108,000 effective doctors will remain, of whom 84,000 are specialists and general practitioners, 15,000 public-health workers, and 8000 hospital residents and interns.[1] If distribution were equal there would be one general practitioner for every 1557 people, but in fact there is acute shortage of medical care in many towns and districts, especially where the population has risen sharply through the growth of war industries. A recent survey by the US Public Health Service showed for example that a Southern city which three years ago had 25,000 inhabitants had now some 70,000, served by 14 effective doctors and 4 dentists. The doctors could do little visiting and some refused night calls: for a dental appointment people had to wait 3½ months. At the same time there was a shortage of houses, food stores, restaurants, and laundry services, and it was not surprising that workers in the local war factories had absence-rates up to 11–16%. The only hospital contained 68 beds, of which 18 in the basement, reserved for negroes, were seldom used, because negro doctors were denied facilities. In this overcrowded community the medical profession was not in a position to cope with possible epidemics, and the same is true of many other cities. Left to itself, the situation throughout the country will grow no easier; for 80% of new medical graduates are absorbed by the army and navy, and to replace the 2500–3000 doctors removed each year by death there will probably be less than 1500 civilian entrants.

To protect their home population the American authorities have adopted not only temporary expedients but also a boldly progressive policy. The expedients include limitation of military recruitment of doctors to the 20 states that are relatively well supplied, the persuasion of practitioners to move to places that need them badly, and efforts to get over difficulties in the full employment of the 6000 refugee practitioners now in the states, only 2000 of whom are US citizens. The wider policy includes not only expansion of industrial health services, campaigns against venereal disease and prostitution, and a programme of mass radiography to discover cases of tuberculosis, but also (notwithstanding the rival demands of war) increased expenditure on sanitary schemes, on hospitals, and health centres—these last "usually providing clinics and 6 to 8 emergency beds." The USPHS aims at helping local authorities to organise cooperative use of doctors and facilities for greater efficiency wherever consent can be obtained. In one area the local profession opposed the building of a health centre because, they said, it pointed the way towards socialisation of medicine; they also opposed free immunisation of industrial workers by public health officials, on the ground that the workers were amply able to pay for injections and the like. But it is significant that, once a shortage of doctors is admitted, it becomes increasingly difficult to hold such views, even in a country so individualist as the USA.

1. These figures and facts are taken from a survey, Doctor Shortage and Civilian Health in Wartime, issued on Sept. 4 by the Office of War Information.

FRUSTRATION AND FULFILMENT

THE promoters of the course of lectures at Caxton Hall that was announced in our last week's issue have in their title brought to a focus many lines of modern thought. The psychology of frustration and fulfilment should indicate the study of all that concerns man's happiness, individual and social, all his strivings, conscious and unconscious, rational or instinctive, and the reactions that follow the conflict between what instinct demands and what the needs of a social organisation may tend to deny. It should include the study of those personal problems whose elucidation by Sigmund Freud first showed the significance of inner conflict and its influence on emotion and behaviour, the study of education as a process in the adjustment of the child to the calls of an insistent world, and also, what is immediately most important, the search for a remedy for man's failure to achieve national and social stability. These requirements are admirably met by the different personalities of the speakers in this course, to each of whom is allotted four lectures—too few for the full consideration of so vast a theme but enough to provide a systematic exposition of some parts of it. To Miss Anna Freud will come the opportunity of showing how the work of her famous father offers an understanding of problems that in its absence would appear insoluble; Miss Rooker, with the advantage of years of experience, will deal more specifically with the practical application of general principles to education; whilst those who would welcome wise counsel applicable to the difficulties looming ahead of us should find it in Professor Macmurray's talks on social sources of frustration and fulfilment.

FOR gallant and distinguished services in North Africa the OBE has been awarded to Lieut.-Colonel H. T. Chiswell, LMSSA, RAMC, and to Lieut.-Col. R. A. King, MB LOND, RAMC.

". . . Bureaucracy is a well-worn word. I wonder how many times it was used in 1911. I suppose it means an over-organisation. No-one will deny that in this complicated world some organisation is necessary, but the Government are as anxious as anyone else to see that nothing is done to strangle and inhibit progress in one of the greatest professions of the human race—the profession of medicine."—The MINISTER OF HEALTH, speaking at Cardiff on Sept. 14.

Special Articles

DERMATITIS FROM CUTTING OILS

G. P. B. WHITWELL, M D LOND
WORKS MEDICAL OFFICER

OIL and alkalis are two of the most important causes of dermatitis in industry, and at present cutting oils and similar liquids form an especial interest owing to the great quantities used.

The problem of oil dermatitis and the underlying principles of prevention and treatment are simple, and if understood make of these common industrial rashes a nuisance rather than a menace; but if on the other hand a constant watch is not kept on the problem, there may be serious loss of production and unnecessary labour changes.

CUTTING OILS AND LIQUIDS

I have studied my cases with two ends in view—firstly to discover the type of rash, and secondly to correlate this with the cutting oils or liquids at fault. Cutting oils and liquids are used in engineering for several purposes. A jet of the liquid is projected on to the edge of the tool, grinding wheel, or some such part in order to prevent overheating, to preserve the tool (often an expensive item) and for several other reasons which have no medical interest.

The liquids chiefly used are the so-called soluble oils which are commonly called "suds," a name which probably dates from the days when this liquid was soap and water. Modern soluble oils vary in composition and in skin-irritating power, but are often emulsions of mineral oil along with a fatty oil which is saponified with an alkali. Wood-alcohol or ammonia may be present and sometimes an oil derived from coal is used instead of the petroleum-derived oil. A phenolic-type disinfectant is commonly added by the blenders. The neat soluble oils are diluted with water in varying proportions: perhaps 1 part of oil to 30 of water. The resulting mixture is usually milky but modern types of soluble oils may be translucent. If the added water is hard the oil vendors sometimes advise the addition of an alkali at about ½% strength, though water from a water-softening plant would be preferable. In hot weather the suds may decompose and the smell is offensive; to counteract this it is sometimes the practice to add more phenolic disinfectant; in our works one part of 'Izal' to 600 suds is used. It is easily seen, therefore, that suds may eventually become quite a battery of diluted chemicals, and although these dilutions are safe for occasional use, they easily produce irritation in those whose forearms and hands are wet all the long hours of the working day. It is possible that in the case of anthracene oils irritating chemicals may be derived from the coal. There is also one very important additional way in which suds may become hazardous: when contaminated with oil or paraffin which is carried on the component from a previous operation. Nevertheless a good soluble oil if used aright should give little trouble. We use two types in our works; one is described as having a "sulphur-naphthenic base," and is opalescent on adding water, the other has a "very high saponifiable content."

Another common type of cutting liquid is a mineral oil containing a varying amount of lard oil to which may be added colloidal sulphur, or a process of chlorination may be used. I have not seen much trouble from sulphurised oils so far; they commonly contain an oil-soluble disinfectant such as pine oil. More important from the medical point of view are the paraffin (kerosene) and mineral oil mixtures, or the paraffin and mineralised lard oil mixtures. These produce many rashes of all types and should not be used where there are suitable alternatives. It should be explained that the term kerosene (or paraffin) means in this paper the fraction which comes over after gasoline on distillation of crude petroleum: it is, in fact, the kerosene commonly used for lamp oil. These two groups of oils (the sulphurised and the kerosene-mixture types), of course, are used straight—that is without addition of water.

The skin reactions to all these cutting liquids are of two main types: follicular eruptions and eczematoid reactions. The first type is by far the commoner; a severe eczematoid reaction is by no means common in our works, although a mild reaction is seen quite often. On the whole men favour the follicular reaction, and women the eczematoid.

FOLLICULAR ERUPTIONS

Chronic oil folliculitis (oil acne).—This occurs mostly in men; women are only mildly affected. The individual especially attacked is usually dark in complexion and having much body hair. The second factor may explain the comparative female immunity. The rash is not invariably confined to the extensor surfaces of the limbs, the site depending to a large extent on the machine and the job. Some machines throw oil on to the thighs, some mainly soak the arms, and of course the best way to get an oil rash is to wear oil-soaked clothes, not forgetting the rolled-up sleeves which are responsible for quite a lot of trouble. In all cases indolent papules form round the pilosebaceous follicles, and where the hairs are long (as on the extensor surface of the forearms) deep nodules form which suppurate. The papules once formed last a good many weeks. A fortnight's exposure can produce an oil rash in some workpeople, and by experimenting on a volunteer I find that a daily 8-hour application of oil-soaked lint to the thigh can produce papules in 2–7 days.

The comedo appearance so often seen is not essential to the clinical picture and depends on the cleanliness or otherwise of the oil; it is in any case quite dissimilar to the comedo of acne vulgaris for it appears to be more in the nature of a horny plug. When the oil acne is severe it is common to observe boils in the rash-bearing area, and until this occurs the rash produces but little symptoms. The final result of an oil papule is a pitted scar. Paraffin and mineral oil mixtures (or paraffin mixed with mineralised lard oil) are cutting liquids which produce most of our severe cases. From all other oils we do not get much oil acne. The addition of paraffin to any mineral oil seems to increase the follicular irritating property of that oil. As previously stated the suds may become hazardous and produce severe oil acne from an admixture of oils carried from a previous operation; in our works this specially applies to the carrying over of paraffin oil mixtures. Uncontaminated soluble oils produce a mild acne (without comedos) on the elbows and legs of female workers. Lard and mineral oils mixtures are also not specially hazardous, in my experience; the same applies to the engine lubricating oils which we use. I wish to stress that the mixing of paraffin with cutting oils is most undesirable for the operative.

Acute oil folliculitis.—This curious reaction is common in those who handle mineral oil and paraffin mixtures, or in those who swill engine parts in paraffin for degreasing purposes. I have not seen it where paraffin has not been present. The condition is a fine acute folliculitis, sudden in onset, occurring mostly on the flexor surfaces of the forearms, and sometimes the neck, chest, face, and legs, attended by much itching, and often reminiscent of sudamina. Like many industrial skin diseases it tends to occur in the hot weather. As the rash subsides there is some exfoliation of the skin. Whether this rash can be caused by pure paraffin I am not able to say—all our paraffin is contaminated to some extent with other oils, and unlike oil acne no pustulation occurs in this condition. Nevertheless it is possible that this acute folliculitis is a sort of acute oil acne in which the penetrative power of the paraffin plays a major rôle; the paraffin may carry minute traces of oil, or other matter, into the follicles. Published work on the subject of paraffin rashes is not extensive and I have traced no mention of any acute folliculitis due to paraffin. The question is complicated by the fact that the term "paraffin" covers a diversity of products. This is a pity, since paraffin causes much industrial skin trouble. A pruritus from paraffin (without rash) is common in those with delicate skins, especially if the paraffin is dispersed in fine droplets, as in freeing parts of paraffin, by means of a jet of compressed air. I find no published mention of this. It is possible too that our present-day paraffin is not of the same quality as in former days, but nevertheless paraffin, standing between petrol and the heavier oils as it does, possesses some of the quality of oil in its follicle-irritating powers, and can also occasion general erythematous and eczematous reactions like those seen with petrol.

ECZEMATOID REACTIONS

These may occur alone or be associated with an oil acne or acute oil folliculitis. The commonest type is where there are well-defined patches of catarrhal erythema, sometimes with an appearance of slight lichenfication, which occur on the forearms and hands of female suds operators, especially in the cases where gloves are worn soaked with suds. Rarely does this erythema come to a frank vesicular stage, except that a mild dysidrosis of the fingers and ulnar border of the hand is sometimes seen as well as interdigital maceration. The forearms and sleeves of these girls often smell strongly of phenolic type disinfectant, and a mild defatting of the horny layers is observed.

Paraffin and paraffin oil mixtures cause a marked diffuse catarrhal erythema in some workpeople; this is often observed on the flexor surfaces of the elbows where the rolled-up sleeves are saturated. In a few cases vesicles appear on the forearms, and on legs if they are contaminated too, but this is only where the erythematous stage is longstanding or neglected. Dysidrosis of the fingers seems occasionally to be provoked by paraffin, but paraffin although irritant does not produce the marked defatting such as is seen with alkalis or fat solvents. Two or three cases of catarrhal erythema of the hands were attributed to sulphurised lard and mineral oil mixture, and one of the cases had previously had a suds rash, but in our works this type of oil is relatively innocuous.

Animal or vegetable oils are generally considered to be less productive of oil acne than the mineral variety, but the former types of oil are not often used unmineralised. Nevertheless all oils are probably irritating to some extent, even olive oil which in the form of camphorated oil has frequently produced an oil acne on the chests of bronchitic infants; a condition formerly described as the "grouped comedos of infants." Dermatologists sometimes ask whether one oil can be substituted for another less toxic in industry. This cannot often be done. The engineer chooses his cutting liquid to suit his job: in cases where great heat is evolved he will usually select a water-soluble oil to counteract this; in other cases lubrication is all important to preserve the edge of an expensive tool and in this case an oilier oil such as mineralised lard oil may be used. However if a soluble oil produces much skin trouble it should be discarded and another brand tried, for there are a great many varieties on the market.

TREATMENT AND PREVENTION

The principles underlying treatment are simple and the results good. Cases of oil acne and acute oil folliculitis respond immediately under supervision, to washing twice daily, with plenty of hot water and soap. This can be done in the works ambulance room under the eye of the nurse. The operative in practically all cases can remain at his work and continue to work in oils; improvement will often be rapid. Daily baths are excellent if the rash is extensive. No other treatment is necessary, although the rash may be rubbed with zinc ointment or some emollient grease. Lint dressings backed with 'Cellophane' or brown non-absorbent wool are useful and will keep out oil, but this is not always possible because some machines are dangerous if dressings are worn. Soap-and-water treatment is doubly valuable because it is propaganda for cleanliness.

Eczematoid reactions are in a different category altogether. Soap and water do harm; a harmless grease will keep most catarrhal erythematous cases at work and will cure them; but if there is gross vesiculation a change to a dry job is necessary and the treatment is the same as for eczema.

Prevention is important. Many cases of oil acne have no symptoms and do not often wash; they will therefore tend to overlook their rashes for some time. This can be corrected by propaganda posters in the factory. The cautionary notice issued by the factory inspectorate —although excellent—has not sufficient propaganda appeal; something with few words and much colour is needed. Equally important is the attitude of the medical staff in attending to early slight rashes. Patients should be encouraged to come early. The factory doctor should make notes as to where his cases work. He will soon discover the black spots in a large factory; he may find that some machines have inadequate splash-guards. Protective clothing should be of synthetic rubber which resists oil and paraffin. Above all the work of the doctor will be largely set aside if the factory washing facilities are inefficient and unattractive. Herein lies the importance of not appointing old and infirm men to clean the wash-places. Many wash-bowls are too small; troughs and well-raised sprinkler-taps are better. Hot air drying is superior to towels, which get dirty.

Barrier protective creams are largely unnecessary but have a limited and occasional use for those who easily become chapped; there is no need to use fancy advertised preparations, and as much benefit is derived from some creams if they are used after rather than before work. In one large factory 960 lb. of clay soap preparation were used in one month and the incidence of skin trouble due to cutting liquids was serious. Operatives washed with it, used it for the treatment of an already present rash, and reapplied it with oily fingers. It was stopped for an experimental period of two months; the rashes had been declining and during this experimental period continued steadily to do so. In another comparable factory of half the size, 14 lb. of a lanoline-containing grease were used per month, and the rashes in this factory were negligible, most operatives using no protective cream at all. The use of barrier creams obscures the main issues which are cleanliness and the proper use and selection of cutting liquids; protective creams should be regarded as a weak second line of defence. These remarks apply to barrier creams only in relation to cutting liquids—their possible use in other connexions is not considered. Many operatives find that some barrier creams are worse than useless when a slight rash has started; the cream seems to aggravate the skin condition.

A simple preventive measure often neglected is to discourage the wearing of oil-soaked clothes. The man who works with his sleeves rolled down will tend to get an oil rash on the wrist, especially if he is hairy; the man who works with his sleeves insufficiently rolled up will start his rash round the elbow: the best shirts are undoubtedly sleeveless. Most oils become harmful if continually rubbed into the epidermis by means of sodden clothing, and the operatives should learn that it is safer to allow the oil to flow freely on the bared skin.

Finally there is the old question whether oil rashes can be prevented by sterilising the oil by heat or antiseptics or by ridding it of metal particles. They cannot. However desirable clean metal-free oil is on other grounds (such as the prevention of sepsis in minute skin punctures) it is quite easy to produce an oil acne experimentally with clean unused metal-free oil, as I have proved. Furthermore, the addition of antiseptics to oils is a potential danger. In some works it is the practice to centrifuge used oil and add antiseptic; this process if repeated may mean the oil eventually collects a dangerously high concentration of antiseptics, whose presence anyway is of doubtful utility, except as a possible inhibitor of fat-splitting organisms where animal or vegetable oils are present. Treating the oils by heat is safer but is said to cause deterioration of some oils. In any case the bacteriological theory of the origin of oil rash is, I think, upset by the fact that mineral oils which discourage bacterial life are much more hazardous than lard or vegetable oil which are better culture media.

What then is the ætiology of oil acne? The two main theories are the mechanical blocking or chemical irritation of the follicles. I agree with those who believe that oil acne is primarily due to a chemical irritation of the follicles, and this is supported by the simple following observation:

If one experimentally applies more oil to any already present oil acne the papules shortly enlarge; if one withholds oil the papules diminish; if the follicles were already mechanically blocked by oil, one would not expect the application of more oil to affect much change in the papules. Furthermore the chemical theory explains the marked difference of toxicity between one oil and another, the cruder cutting oils being much more hazardous than the high-grade lubricating oil.

SUMMARY

Common cutting oils and liquids are: soluble oils usually called "suds" (often emulsions of mineral oil with a fatty oil saponified with alkali); mineral oil

containing a variable amount of lard oil to which colloidal sulphur may be added; paraffin (kerosene) and mineral oil mixtures; and paraffin and mineralised lard oil mixtures.

Skin reactions are mainly either follicular (chronic oil acne and acute oil folliculitis) or eczematoid eruptions. Treatment of the first is by washing twice daily with hot water and soap; treatment of the second is by applying a harmless grease preparation and if necessary arranging a change of job for the patient.

Prevention depends on cleanliness and avoidance of oil-soaked clothes; barrier creams should be only a second line of defence.

Oil acne is probably due to chemical irritation of the follicles by the oil. Sterilisation of the oil or the use of antiseptics in it will not prevent rashes.

In England Now

A Running Commentary by Peripatetic Correspondents

ONCE while walking in northern Italy I spent the night in the village of Feriolo. It was peopled by a fascinating race of dwarfs with big mouths, good teeth and laughing eyes. These little men worked in the quarries for which the place was famous and it was astonishing to see how easily they could move pieces of granite weighing many tons and lift them into wagons with the most primitive of levers and wedges. They sang as they worked but they were very shy of strangers and I felt that one would have to be among them for a long while before being admitted to their friendship. Yet my host at the inn, with whom I sat talking and drinking red wine half the night, unbent magnificently to become a firm friend.

The other afternoon I was labouring fruitlessly with a lithotrite. However skilfully I depressed the nose and however cunningly I went through the manœuvres recommended by the ancients the jaws would close on emptiness and the stone elude me. Suddenly I sensed a swirl in the waters of the bladder, and I was certain that a dozen unseen helpers were busy with primitive levers and wedges, so that in a moment, and with no effort on my part, the stone was lifted into the jaws of the lithotrite. Excitedly I watched the fragments flooding back into the evacuator, fully expecting to see among them one of the laughing men of Feriolo, for I am certain that it is in their image that the Little Men of the bladder are fashioned. They have so many characteristics in common—their craftsmanship, their mistrust of strangers, and their helpfulness to those whom they have admitted to their friendship. Looking back over my early days with the cystoscope I realise now why I laboured so often in vain. It would be one of these resentful little people that would give the mucous membrane a playful kick with his heel causing a mist of blood to obscure a ureter just as it had come into view after a long search. At other times a catheter-tip, obviously heading straight for the ureteric orifice, would receive an unexpected jolt that would send it buckling against the adjacent mucosa. Then perhaps I would get a fleeting glimpse of a retreating figure that would give me an impudent grin, cock a snook and disappear. Yet now, having wooed these small folk with patience and gentleness and some measure of understanding, I look forward with their help to "cystoscopy without tears." For one of their guides is invariably waiting to point out an orifice hidden behind obscuring œdema and willing hands push home the ureteric catheter tip. But even now, when I count them as my friends, these gremlins of the bladder are resentful of any omission of routine or scamping of formality. Roughness and hurry they abhor. Always must they be soothed with a libation of procaine and sometimes offered an assuagement of adrenaline.

I fear I shall never return to Feriolo but I should dearly love to tell my friend at the inn of his cousins of the bladder.

* * *

The little things by which we are judged. In consultation with a colleague recently we entered the patient's room together to find her curled up apprehensively in a corner like an attractive Siamese cat. A few days later, when all her troubles were over and I called again to pay social compliments, she said to me, "Do you know: Doctor, why I had confidence when I met you?" I replied I did not, and she then remarked, "Well, I noticed you were partly left-handed, and so was my father, who was a surgeon, and so I knew all would be well."

* * *

As is only natural at this time of the year we got talking about holidays. With the physician in a minority of one, there was unanimity in grousing at the restrictions imposed by war conditions. (The physician's last deviation from full activity was in 1913, yet I am bound to say he looks the fittest of the lot of us.) Somebody advanced as a general proposition the principle of making one's holiday as complete a reversal as possible of one's normal life and living. Thus the surgeon, one of those dreadful methodical creatures who scrupulously employ every minute of their waking hours, would be boarded out with some Bohemians who ate and slept when the spirit moved them, who to be sure possessed a clock, though whether it was half an hour fast or two hours slow was a matter of complete indifference to them. The poor little radiographer who was helping his missus to keep house, to cook, clean up and look after newly-arrived twins, would be accommodated in a luxury hotel where the exercise of vital functions would be the sole claim on his activities. The pathologist, a typical club-man whose only idea of the country was a place where they grew stuff to eat in London, would be provided with a labourer's cottage and compelled to learn that the familiar reference to the sweat of one's face had a literal as well as a poetical meaning. The assistant physician put in a plea for a busman's holiday. He would revel, he said, in a magnificently equipped hospital where he would be shown a large number of interesting cases all completely worked out; when, all day long, information would be poured into his eagerly receptive channels. As a sine qua non, he was to be asked no questions.

And then the gynæcologist, ostensibly facetious but not without a suggestion of seriousness, advanced the attraction of a month in jail. Granted of course the possibility—if there be a possibility—that incarceration could be ensured without the customary stigma, he was fluent with advantages. First of all, the absence of expense; indeed, so he understood, it was possible to earn a little pocket-money. The diet entrusted to the solicitude of experts was above criticism in its way. Regularity of meals, of work, of relaxation and of exercise was perfectly organised. An abundance of uninterrupted sleep was guaranteed. One enjoyed a mental tranquillity which proceeded from the absence of any necessity to make decisions or keep up appearances, and above all, an unexceptionable inaccessibility to telephonic intrusion.

That, *pace* my talented peripatetic colleague of a few weeks back, was his trump card. For our profession is the outstanding victim of this curse of civilisation which, like all other modern inventions, has its uses but also abuses, against which one vainly contends. You may employ a spirit-lamp for its rapid action in boiling a kettle; it is not economical to use it to heat a room. The telephone has its indication in emergency; it was not intended to replace all other forms of communication, as the lazy moderns evidently imagine and intend. What can be the frame of mind of the person who telephones you at your private address to ask some question or other about his symptoms or his treatment although you may not have seen him for months, even years? Does he really suppose that you can retain in your head pigeon-holed for immediate reference all details clinical and therapeutic of everyone you have ever seen? Does he ever reflect on the abominable unreasonableness and impertinence in dragging you from rest or recreation—thus ensuring a headache, or from a meal—thus ensuring dyspepsia? No wonder we suffer from duodenal ulceration and coronary thrombosis. (I refuse to believe the statistician's pronouncement that these are not unduly prevalent in our profession.) Has he not sufficient imagination to visualise your telephone in some comparatively public place, and the embarrassment consequent on your discussing intimate physical details before a giggling audience? Moreover, any advice he receives in this way he regards as legitimately gratuitous, although the responsibility on your part is increased by the circumstances, the want of any opportunity for reflection, and the danger of misunderstanding. Yet

if rebuked for unreasonableness he is invariably resentful and becomes a life-long enemy. As a rule we are unable to protect ourselves against this infliction. A telephone we must have, for there are genuine emergencies, however widely spaced, for which it is indispensable. But situated as we are, and according to common etiquette, it is impossible to put up a barrage. It is not difficult for anyone to convey the impression that his business is urgent, whatever it is; and the intermediary who summons you is not in a position to assess the degree or truth of the alleged urgency. Time may be gained by going "to see if Dr. X is in" or a possible protection is afforded by having to appeal to Dr. X "in his bath." It may become a source of wonder to inquirers why Dr. X takes a bath at all hours of the day and night!

Perhaps the best defence of all is a talkative little wife with a large circle of lady friends. For the sex has taken very kindly to the telephone. Two women will enjoy forty minutes' telephone conversation although they have actually arranged to meet within half an hour. So the doctor's wife, by blocking the line during most of the day, may contribute to her husband's protection.

Letters to the Editor

GOING UNDERGROUND

SIR,—Have you tumbled to what is happening in the mining industry? There have been three cases reported in the papers of young men, pleading nervous trouble as a reason for not going down pit, being sentenced to imprisonment for their refusal. In one, about three months ago, Mr. Shinwell brought it up in the House and only then was it recognised that the man (given three months) was a claustrophobe. He had previously been examined by a medical board and found fit to work underground. Young Page in Lincoln prison, whose objection to going down was described in the paper as "psychological," has agreed to train for pit work on condition that he is medically examined before going down. The Notts miners went on strike about his case. The chance is that after the fuss he *may* be examined psychologially. In the *Times* yesterday was reported the case of Lashley, fined £5 or 28 days. The secretary of the miner's lodge, in threatening a strike, says the man is "pit nervous" and it is unsafe for him to go down pit. That secretary is a sounder clinical psychologist than some of us.

In my work on miners' nystagmus I found that men receiving compensation for that disorder were mostly suffering from psychoneurotic symptoms (often phobias) which the eye people failed to recognise and the significance of which they could not understand. One authority on the subject, to whom I put this view, retorted that the right thing to do with a man who had phobias was to stop his compensation and make him go down pit. In peace-time this mental attitude only affected individuals. Now it brings out thousands of miners on strike. Unfortunately if the powers that be seek for help on the matter their advisers may actually be people hostile to a psychological view. So where are we?

Guildford, 17.ix.43. MILLAIS CULPIN.

DOCTORS AND POLITICS

SIR,—You have performed a useful public service in drawing attention to the extraordinary document published by the Sheffield branch of the BMA. Its distortion of facts is worthy of Dr. Goebbels. The Government proposals have not been published, and even the Representative Body of the BMA has not yet decided what attitude it will take up; but the Sheffield branch tries to terrify the public, whose intelligence it underestimates by presenting a nightmare picture of helpless humanity sucked into a bureaucratic machine and tossed from one robot doctor to another, while the satanic figure of Mr. Ernest Brown rubs its hands in the background.

Even more striking, however, is the ineptitude of this line of propaganda. Do the authors seriously think that people who are already in the habit of consulting doctors not of their own choice at ante- and post-natal clinics, school clinics, child welfare clinics, tuberculosis dispensaries, VD clinics, as well as the numerous outpatient departments of hospitals, and the factory doctor whose supervision many of them who are in industry now enjoy at their place of work, will be frightened by such a bogy story?

Many of us who are already salaried medical officers, whether in the employment of local authorities, hospitals, or government departments, are becoming a little tired of the implied slight on us made by certain diehard opponents of a comprehensive medical service within the profession. Most of us could produce as long a list of grateful and satisfied patients as any private practitioner, and do not require the bait of a fee to give of our best, as some of the anti-planners suggest.

The Sheffield branch will have to discover a better argument than this if it hopes to arouse public opposition to any change in the status quo.

F. H. TYRER.

ACCESSORY HEART SOUNDS

SIR,—I am in complete agreement with your annotation of Sept. 4 that the "split" second sound should be clearly distinguished from the normal third heart sound. Unfortunately the term "reduplicated" second sound has been applied to both these phenomena. You regard it as synonymous with split second sound, while I was under the impression that it was more commonly applied to the third heart sound. (Incidentally *re*duplicated means quadrupled, duplicated is surely more correct). Clinically, as you point out, it is easy to distinguish between these two types of duplication by the rhythm of the sounds. Since the split second is due to asynchronous closure of the aortic and pulmonary valves, it is best heard at the base of the heart, whereas the third heart sound being due to the tension set up in the A-V valve cusps by the first inrush of blood from auricle to ventricle is best heard at or near the apex. To prevent confusion it would appear desirable to avoid the ambiguous term "duplicated" and to speak only of a "third heart sound" and of a "split second sound." But it will take time to accustom clinicians to this nomenclature.

Manchester. CRIGHTON BRAMWELL.

FIRST AID FOR FRACTURE OF LOWER JAW

KELSEY FRY-MOIR METHOD

SIR,—First-aid teaching on fracture of the mandible is far from satisfactory, and the principal manuals omit essentials. The following instructions, devised in collaboration with Mr. W. Kelsey Fry, are proposed for the use of medical students and first-aiders. If they are acceptable, it would be a great advantage if they were adopted by all the various services and teaching bodies. All first-aiders should be taught the same standard methods.

SIGNS AND SYMPTOMS

Pain. Difficulty in swallowing or speaking. Irregularity in the line of the teeth.

COMPLICATIONS

OBSTRUCTION OF THE AIRWAY, caused by (*a*) the tongue falling back or (*b*) blood-clot, teeth or foreign bodies.
BLEEDING. SHOCK.

TREATMENT OF SLIGHT CASES

If the airway is not obstructed and there is little bleeding or shock, all that is needed is a barrel bandage applied as described below.

TREATMENT OF SEVERE CASES

MOST IMPORTANT: KEEP THE AIRWAY CLEAR.—If obstruction is obvious, the tongue must be immediately grasped with a dry cloth or handkerchief and pulled forwards.

The mouth and throat should be cleared with the forefinger.

To prevent the tongue falling back, or blood collecting and clotting in the mouth or throat, the patient is placed in such a position that his face points towards the ground. If *conscious* and not injured elsewhere, he may be put in a sitting position leaning forwards. If *unconscious* he must be turned to the prone position and his head placed in the crook of his arm.

BLEEDING.—The great danger of bleeding is that blood will collect and clot and block the airway. If bleeding is very severe the common carotid may have to be compressed at its pressure-point till medical assistance is obtained.

DRESSING AND BANDAGE.—External wounds are covered with a sterile dressing. A barrel bandage is then applied.

SHOCK.—Keep the patient comfortably warm with coats, rugs and hot-water bottles if necessary. If there is no

bleeding, fluids (preferably hot sweet tea) can be given through the spout of a feeding-cup or of a small teapot. Reassurance and encouragement will be needed.

TRANSPORT.—(*a*) *Walking.* If the patient can walk, he should rest his hands on somebody's shoulders, so that he can be guided and at the same time keep his head down. (*b*) *By stretcher.* He is placed on a blanketed stretcher in the prone position with his head resting in the crook of his arm. (*c*) *By ambulance or car.* If able to do so, he sits with his head and shoulders forward, if not, he lies prone on a stretcher with his head resting in the crook of his arm.

THE BARREL BANDAGE

The bandage used may be :—

A roller bandage 2 yd. long by 1½–2 in. wide.

A triangular bandage (large size) folded narrow.

A first field dressing. This is a dressing attached to 2½ yd. of bandage 2½ in. wide. The dressing is first detached from the bandage and used as described.

(*a*) Apply the bandage with the patient sitting up if possible.

(*b*) Place the dressing on the wound. Then put the centre of the bandage under the jaw, just in front of the angle of the jaw.

(*c*) Bring the ends of the bandage up over the angle of the jaw and tie them in a simple knot on the crown of the head.

(*d*) Keeping a firm hold of both ends of the bandage, and using both hands, open the knot and bring one loop forwards in front of the forehead while the other goes round the base of the skull, making a circle round the head. The forward loop is brought forward so that it lies just below the eyebrows; the backward loop is carried back to the base of the skull just below the ear. These two loops cross just above and in front of each ear. (NB. The bandage under the jaw must be kept firm throughout.)

(*e*) Tie the ends of the bandage in a reef-knot on the top of the head.

I should be glad to receive comments or suggestions that might lead to the improvement of these instructions.

Cemaes Bay, Anglesey. J. L. MOIR.

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WEEK ENDED SEPT. 11

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 2432; whooping-cough, 1751; diphtheria, 700; paratyphoid, 5; typhoid, 9; measles (excluding rubella), 516; pneumonia (primary or influenzal), 308; puerperal pyrexia, 157; cerebrospinal fever, 33; poliomyelitis, 9; polio-encephalitis, 3; encephalitis lethargica, 0; dysentery, 201; ophthalmia neonatorum, 95. No case of cholera, plague or typhus fever was notified during the week.

The number of civilian and service sick in the Infectious Hospitals of the London County Council on Sept. 8 was 1689. During the previous week the following cases were admitted: scarlet fever, 227; diphtheria, 41; measles, 18; whooping-cough, 48.

Deaths.—In 126 great towns there were no deaths from scarlet fever or enteric fever, 12 (0) from whooping-cough, 6 (1) from diphtheria, 52 (6) from diarrhœa and enteritis under two years, and 6 (0) from influenza. The figures in parentheses are those for London itself.

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BY a mischance portraits of Dr. CECIL PRICE-JONES and of Dr. AUSTIN BYRNE did not accompany the memoirs in our last issue. Any reader who likes to send a stamp will receive a print of either.

Obituary

Wm IRELAND DE COURCY WHEELER

KT, MD DUBL, MCH EGYPT, FRCSI, FACS

Sir William Wheeler, who died in Aberdeen on Sept. 11 at the age of 64, had lived an eager life of unremitting activity. He had practised in two capitals, his own native Dublin and London; and he had served in two wars, holding high rank in each in a different service. He came of famous surgical stock, for his father like himself was president of the Royal College of Surgeons in Ireland. He graduated in the faculty of arts at Trinity College, Dublin, as moderator and medallist in 1899, and three years later in the faculty of medicine with high distinction. He held the appointment of demonstrator and assistant to the professor of anatomy there and for his research into deaths under chloroform the Dublin Biological Association, of which he was later to become president, awarded him their medal in 1903. Election to the staffs of the Rotunda and Mercer's Hospitals came quickly, and he also lectured in surgery to postgraduates in the University of Dublin. During the last war Wheeler served with the rank of lieut.-colonel as consultant in surgery to HM Forces in Ireland, and was donor and surgeon of the Dublin Hospital for Wounded Officers. His counsel was sought by many official bodies. He was a member of the War Office council for consultants in 1917, and of their tetanus commission. He sat on the Ministry of Pensions committee on artificial limbs, and he was consultant surgeon to the ministry in Ireland. He examined for the National University of Ireland and the Universities of Belfast, Edinburgh and Glasgow, and he was inspector of examinations for the Medical Registration Council in Ireland.

In 1932 Wheeler migrated to London and the diversity of his interests is well illustrated by his appointments there. He was on the staff of the New Southend-on-Sea Hospital, of All Saints Hospital for Genito-Urinary Diseases, and of the Metropolitan Ear, Nose and Throat Hospital. He also became inspector of hospitals for King Edward's Fund. And this all-roundness made him a valued member of the editorial staffs of the *British Journal of Surgery* and of the *British Journal of Urology*, while his American contacts made him an obvious choice as an editorial consultant for *Surgery, Gynecology and Obstetrics*. As one of the few British Murphy orators he addressed the American College of Surgeons in 1932 on the surgery of the blood-vessels, and he also held office as president of the Post Graduate Assembly of North America. In this war Wheeler served once more, this time as a surgeon rear-admiral, and at the time of his death he held the appointment of consulting surgeon to the Royal Navy in Scotland.

Wheeler married in 1909 Elsie, the eldest daughter of Baron Craigmyle, then the Rt. Hon. Alexander Shaw, KC, MP, and they had a son and a daughter.

G. G.-T writes: Wheeler was always immensely proud of the medical and surgical tradition of Dublin, and of the hospitals where he received his early training and where the major portion of his surgical life was spent. He adhered with staunch devotion to those methods of surgical technique in which he had been schooled or which he had embraced as a postgraduate disciple in clinics in Britain, America or Europe; he admired Moynihan, worshipped Kocher, and adored Robert Jones. Yet he was no mere *laudator temporis acti*, despite his hero-worship and his rich knowledge of surgical, and especially Irish surgical history. Though intensely loyal to the Thomas splint, he was not bigoted or blind to the value of plaster-of-paris; he was not merely a suprapubic prostatectomist, but also an expert in endoscopic resection; the first occasion on which I saw de Martel's intestinal clamp used was in the Mercer's Hospital about 1923. Till the end of his life he retained that feeling "which impels a teacher to be a contributor and to add to the stores from which he so freely draws." His surgical interests and writings were catholic in their scope; the list of his contributions bewilders by their number and the diversity of subject, and the reader is enthralled by the presentation and captivated by the impeccable language in which each communication is couched. Wheeler had a special

interest in the injuries and diseases of bone. He was an intransigent opponent of all who dared to decry Syme's amputation, and hostile criticism of the operation only made him champion the procedure more ardently. All Irishmen are politicians, and Sir William did not shrink from the eddies of medical politics. He had a lively wit, and his countrymen's gift of repartee. He was an entertaining raconteur, and his natural kindliness made him a popular examiner; it was a privilege to be his patient, for within him there beat a heart of gold."

GEORGE MACBETH CALDER

MB EDIN; CAPTAIN RAMC

Captain G. M. Calder, the eldest son of Prof. W. M. Calder, FBA, was wounded at El Alamein last October and died of his wounds in Cairo in April. He was born in Aberdeen in 1912 and educated at Salem, Baden, and at Edinburgh University where his father holds the chair of Greek. He qualified in 1936 and had gained experience in house-appointments and as locum in several practices before he joined the RAMC. In the Army he served at first with a field ambulance, but later he had an opportunity for psychiatric work, the branch of medicine in which he was particularly interested.

Bacon, Edinburgh

W. M. M. writes: George Calder's appearance was fittingly striking—a mop of unruly red hair, a broad confident build, a voice that reverberated enthusiasm. Of rare intellect, he was at the same time practical, skilful with his hands, a keen and talented sportsman. He had a strong political sense, was well informed, and loved an argument or a debate. Having been educated in Germany he spoke German fluently; he knew Nazism better, and despised it more, than most people. He loved accumulating out-of-the-way information and in many amusing ways applied this knowledge in making gadgets and giving his friends brain-teasers. Beneath his placid unruffled exterior he was a man of deep and genuine feeling for the welfare of his fellow men. He was both selfless and unselfconscious, Once, as a student, while the others were eagerly attending to a lecture round an aged patient, George Calder could only notice that the lecturer to emphasise his points was throwing the temperature chart on the old lady's sore leg. As though it were the most natural thing to do he raised his voice above the lecturer's, and stopped him in the middle of his discourse. Calder saw clearly what were the most important things in life; he had little respect for humbug and cared nothing for prestige or wealth. He might not have become eminent in his profession, but his friends at any time of need were sure of finding him smiling, willing and most competent human.

DONALD ALEXANDER COLES

MD BRUX, MRCS

MANY will learn with sorrow of the death of Donald Coles at the age of 88. On the distaff-side he claimed Scottish descent; but it only landed him in an interminable law-suit over an estate in Morayshire which, after the case had been won, had to be sold to pay the lawyers. Otherwise he was typically a Londoner. His mind was always keenly and widely alive, never satisfied with any specialised branch of his profession. He qualified in 1879 from St. Bartholomew's Hospital, and after holding house-appointments there and at Great Ormond Street he joined a partnership in Chiswick. The last war brought him back from Jerusalem, where he had been attached to the English Hospital and where he had acquired much experience of the East, its political problems, its art and traditions. He became medical officer to the Gas, Light and Coke Company of London. Still ready, though now in his sixties, to take interest in every advance in knowledge, he was soon accepted as an authority on industrial hygiene which was just developing as a new branch of medicine. He became an associate editor of the *Journal of Industrial Hygiene* and the medical committee of the Industrial Welfare Society were quick to recognise in this great-hearted and well-informed enthusiast an ideal chairman. Once Coles was presiding, business was sure to be harmonious and discussion to the point. Moreover, he always attended meetings, whether at home or abroad—even, as his friends discovered one evening by chance, on his golden wedding day.

ASHELEIGH LEWIS THORP

MB DURH; CAPTAIN RAMC

Captain A. L. Thorp was one of the medical casualties of the landing in Sicily. He was killed in July while going to help a wounded sergeant. The son of Dr. Eustace Thorp of Sunderland he received his medical training at King's College, Newcastle-on-Tyne, where he was good at all sports, particularly swimming, football and long jumping. After graduating in 1940 he spent twelve months in a resident appointment at Sherburn Hospital, co. Durham. He joined up in 1941 and saw service in India as well as in the Middle East. He was twenty-five years of age. Mr. Stanley Ritson, his chief at Sherburn writes: "Thorp was a tall young man, modest and with pleasant manners. He had a zest for life and its enjoyment, but also an earnest desire to do good work, to improve his professional knowledge and to live up to the ideals of his profession. During his stay with us he proved himself keen, reliable and energetic, and gained the affection and respect of us all. We heard from him at intervals during his period of service, but his letters asked more after the welfare of those at the hospital than told us of his own. He was a fine young fellow."

HELTON GODWIN BAYNES

MB CAMB

Dr. Godwin Baynes, who died on Sept. 6 at the age of 61, was one of the leaders of the second generation of modern psychotherapists. A teacher without a school, he leaves few pupils but many friends. He pointed the way, though he did not map the path.

His gifts were exceptional and his life adventurous. At Cambridge he played football for Trinity College, swam for the university, and was a famous rowing blue. Later he became a mountaineer; and he was an accomplished singer. From a house appointment at Bart's in 1910 he set off characteristically for the Balkan wars, and became surgeon in charge of the Red Crescent Mission to Turkey, where he saw medicine in the raw. Two years in general practice at Wisbech ended in further war service with the RAMC in France, Mesopotamia and Persia. From graduation onwards his main interest had been medical psychology, and in 1919 he went to the Maudsley Hospital as a resident. Thence he moved to Zürich to become assistant to Jung for several years, and in 1925 he organised Jung's expedition to East Africa for psychological research among Masai tribes in Kenya. Later he translated and edited some of Jung's works.

About the close of last century a new dimension had been added to the study of man's emotional, intellectual and social life; the unconscious had become the richest field of mental exploration and afforded the greatest scope for imaginative and constructive enterprise. Two names are outstandingly associated with this work, Freud and Jung. Freud's method was analytical and reductive; Jung's leaned for its guiding principles more on the development of intuition: Freud tried to trace the characteristics of a person's behaviour to events in that person's own past experience which were for the most part hidden; Jung tried by study of individual behaviour and development to discern the influence of extra-personal forces upon the course of personal destiny. In a culture that set high value upon the analytical techniques and was ready to dub as quackery any attempt to use intuition and analogy as the main guide in a serious investigation, it needed courage to follow the path Baynes took. Unlike the weaker folk who allow themselves the illusion that good will triumph in the end if faith be but blind enough, he approached the problem

bleeding, fluids (preferably hot sweet tea) can be given through the spout of a feeding-cup or of a small teapot. Reassurance and encouragement will be needed.

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In 1932 Wheeler migrated to London and the diversity of his interests is well illustrated by his appointments there. He was on the staff of the New Southend-on-Sea Hospital, of All Saints Hospital for Genito-Urinary Diseases, and of the Metropolitan Ear, Nose and Throat Hospital. He also became inspector of hospitals for King Edward's Fund. And this all-roundness made him a valued member of the editorial staffs of the *British Journal of Surgery* and of the *British Journal of Urology*, while his American contacts made him an obvious choice as an editorial consultant for *Surgery, Gynecology and Obstetrics*. As one of the few British Murphy orators he addressed the American College of Surgeons in 1932 on the surgery of the blood-vessels, and he also held office as president of the Post Graduate Assembly of North America. In this war Wheeler served once more, this time as a surgeon rear-admiral, and at the time of his death he held the appointment of consulting surgeon to the Royal Navy in Scotland.

Wheeler married in 1909 Elsie, the eldest daughter of Baron Craigmyle, then the Rt. Hon. Alexander Shaw, KC, MP, and they had a son and a daughter.

G. G.-T writes: Wheeler was always immensely proud of the medical and surgical tradition of Dublin, and of the hospitals where he received his early training and where the major portion of his surgical life was spent. He adhered with staunch devotion to those methods of surgical technique in which he had been schooled or which he had embraced as a postgraduate disciple in clinics in Britain, America or Europe; he admired Moynihan, worshipped Kocher, and adored Robert Jones. Yet he was no mere *laudator temporis acti*, despite his hero-worship and his rich knowledge of surgical, and especially Irish surgical history. Though intensely loyal to the Thomas splint, he was not bigoted or blind to the value of plaster-of-paris; he was not merely a suprapubic prostatectomist, but also an expert in endoscopic resection; the first occasion on which I saw de Martel's intestinal clamp used was in the Mercer's Hospital about 1923. Till the end of his life he retained that feeling "which impels a teacher to be a contributor and to add to the stores from which he so freely draws." His surgical interests and writings were catholic in their scope; the list of his contributions bewilders by their number and the diversity of subject, and the reader is enthralled by the presentation and captivated by the impeccable language in which each communication is couched. Wheeler had a special

interest in the injuries and diseases of bone. He was an intransigent opponent of all who dared to decry Syme's amputation, and hostile criticism of the operation only made him champion the procedure more ardently. All Irishmen are politicians, and Sir William did not shrink from the eddies of medical politics. He had a lively wit, and his countrymen's gift of repartee. He was an entertaining raconteur, and his natural kindliness made him a popular examiner; it was a privilege to be his patient, for within him there beat a heart of gold."

GEORGE MACBETH CALDER

MB EDIN; CAPTAIN RAMC

Captain G. M. Calder, the eldest son of Prof. W. M. Calder, FBA, was wounded at El Alamein last October and died of his wounds in Cairo in April. He was born in Aberdeen in 1912 and educated at Salem, Baden, and at Edinburgh University where his father holds the chair of Greek. He qualified in 1936 and had gained experience in house-appointments and as locum in several practices before he joined the RAMC. In the Army he served at first with a field ambulance, but later he had an opportunity for psychiatric work, the branch of medicine in which he was particularly interested.

Bacon, Edinburgh

W. M. M. writes: George Calder's appearance was fittingly striking—a mop of unruly red hair, a broad confident build, a voice that reverberated enthusiasm. Of rare intellect, he was at the same time practical, skilful with his hands, a keen and talented sportsman. He had a strong political sense, was well informed, and loved an argument or a debate. Having been educated in Germany he spoke German fluently; he knew Nazism better, and despised it more, than most people. He loved accumulating out-of-the-way information and in many amusing ways applied this knowledge in making gadgets and giving his friends brain-teasers. Beneath his placid unruffled exterior he was a man of deep and genuine feeling for the welfare of his fellow men. He was both selfless and unselfconscious. Once, as a student, while the others were eagerly attending to a lecture round an aged patient, George Calder could only notice that the lecturer to emphasise his points was throwing the temperature chart on the old lady's sore leg. As though it were the most natural thing to do he raised his voice above the lecturer's, and stopped him in the middle of his discourse. Calder saw clearly what were the most important things in life; he had little respect for humbug and cared nothing for prestige or wealth. He might not have become eminent in his profession, but his friends at any time of need were sure of finding him smiling, willing and most competent human.

DONALD ALEXANDER COLES

MD BRUX, MRCS

MANY will learn with sorrow of the death of Donald Coles at the age of 88. On the distaff-side he claimed Scottish descent; but it only landed him in an interminable law-suit over an estate in Morayshire which, after the case had been won, had to be sold to pay the lawyers. Otherwise he was typically a Londoner. His mind was always keenly and widely alive, never satisfied with any specialised branch of his profession. He qualified in 1879 from St. Bartholomew's Hospital, and after holding house-appointments there and at Great Ormond Street he joined a partnership in Chiswick. The last war brought him back from Jerusalem, where he had been attached to the English Hospital and where he had acquired much experience of the East, its political problems, its art and traditions. He became medical officer to the Gas, Light and Coke Company of London. Still ready, though now in his sixties, to take interest in every advance in knowledge, he was soon accepted as an authority on industrial hygiene which was just developing as a new branch of medicine. He became an associate editor of the *Journal of Industrial Hygiene* and the medical committee of the Industrial Welfare Society were quick to recognise in this great-hearted and well-informed enthusiast an ideal chairman. Once Coles was presiding, business was sure to be harmonious and discussion to the point. Moreover, he always attended meetings, whether at home or abroad—even, as his friends discovered one evening by chance, on his golden wedding day.

ASHELEIGH LEWIS THORP

MB DURH; CAPTAIN RAMC

Captain A. L. Thorp was one of the medical casualties of the landing in Sicily. He was killed in July while going to help a wounded sergeant.

The son of Dr. Eustace Thorp of Sunderland he received his medical training at King's College, Newcastle-on-Tyne, where he was good at all sports, particularly swimming, football and long jumping. After graduating in 1940 he spent twelve months in a resident appointment at Sherburn Hospital, co. Durham. He joined up in 1941 and saw service in India as well as in the Middle East. He was twenty-five years of age. Mr. Stanley Ritson, his chief at Sherburn writes: "Thorp was a tall young man, modest and with pleasant manners. He had a zest for life and its enjoyment, but also an earnest desire to do good work, to improve his professional knowledge and to live up to the ideals of his profession. During his stay with us he proved himself keen, reliable and energetic, and gained the affection and respect of us all. We heard from him at intervals during his period of service, but his letters asked more after the welfare of those at the hospital than told us of his own. He was a fine young fellow."

HELTON GODWIN BAYNES

MB CAMB

Dr. Godwin Baynes, who died on Sept. 6 at the age of 61, was one of the leaders of the second generation of modern psychotherapists. A teacher without a school, he leaves few pupils but many friends. He pointed the way, though he did not map the path.

His gifts were exceptional and his life adventurous. At Cambridge he played football for Trinity College, swam for the university, and was a famous rowing blue. Later he became a mountaineer; and he was an accomplished singer. From a house appointment at Bart's in 1910 he set off characteristically for the Balkan wars, and became surgeon in charge of the Red Crescent Mission to Turkey, where he saw medicine in the raw. Two years in general practice at Wisbech ended in further war service with the RAMC in France, Mesopotamia and Persia. From graduation onwards his main interest had been medical psychology, and in 1919 he went to the Maudsley Hospital as a resident. Thence he moved to Zürich to become assistant to Jung for several years, and in 1925 he organised Jung's expedition to East Africa for psychological research among Masai tribes in Kenya. Later he translated and edited some of Jung's works.

About the close of last century a new dimension had been added to the study of man's emotional, intellectual and social life; the unconscious had become the richest field of mental exploration and afforded the greatest scope for imaginative and constructive enterprise. Two names are outstandingly associated with this work, Freud and Jung. Freud's method was analytical and reductive; Jung's leaned for its guiding principles more on the development of intuition: Freud tried to trace the characteristics of a person's behaviour to events in that person's own past experience which were for the most part hidden; Jung tried by study of individual behaviour and development to discern the influence of extra-personal forces upon the course of personal destiny. In a culture that set high value upon the analytical techniques and was ready to dub as quackery any attempt to use intuition and analogy as the main guide in a serious investigation, it needed courage to follow the path Baynes took. Unlike the weaker folk who allow themselves the illusion that good will triumph in the end if faith be but blind enough, he approached the problem

of neurotic disorder in terms of a conflict between archaic forces of constructiveness and destructiveness which found expression in manifest and disguised form in human behaviour, and whose roots were revealed in dreams, works of art and social structure. Some dismissed his works on the ground that they were empirical; others read them for that very reason. He wrote them to disclose the way in which these protean forces could, if faced squarely, be prevented from wrecking the lives of men. Distrusting systematisation, his teaching had imaginative force rather than the provision of frameworks of reference; when reproached with his neglect of posterity he sighed and said that his writings would some day be forthcoming. In 1939 appeared his great book *Mythology of the Soul*, which in size, depth and breadth of vision embodied his best work; and then, by a cruel turn of fate, the stocks of the book were bombed so that comparatively few copies remain.

Baynes's independence of mind, and the difficulty—inherent in any work depending largely on intuition—of linking up his findings with those of others using another method or approach, have led to unmerited neglect of his often penetrating thought; his prose was serene but his idiom difficult. Many may overcome the difficulty for themselves, or there may arise an interpreter. A few had the privilege of seeing his mind, informed and guided by a spirit of uncommon depth of feeling, at work upon the profoundest mystery of this or any other time.

Notes and News

FUTURE OF FRIENDLY SOCIETIES

Sir William Beveridge in his report on Social Insurance assumed that the approved society system would have to go because of the inequality in the state benefits which it offered, and that sickness benefits could not be entrusted to societies and companies without responsibility for administering them carefully. He proposed that industrial insurance should be taken over as a public monopoly, using the existing agents as servants of the community, with no interest save that of service to the public. But he was clear that friendly societies which are now offering sickness benefit of their own should continue to administer state benefit as fully responsible agents. In an important address delivered at Stroud last Saturday, reported in the *Times* of Sept. 20, he regretted that the National Conference of Friendly Societies had decided to put forward a plan conflicting with the fundamental principle on which health insurance had been administered for 30 years. The Government, he went on to say, appear to have accepted in principle three of the proposed features—comprehensiveness of income insurance, a national health service and children's allowances—but appear to have rejected adequacy of benefit in amount and time, and have not yet accepted unity of administration. He had hoped that his plan would be put through without delay by general agreement; it was still not too late for this to happen if the people of the country clearly wished it.

NUTRITION SURVEY IN PALESTINE

THERE is little obvious undernourishment in Palestine but a survey now being conducted by the Health Department has already shown that part of the urban population is suffering from malnutrition due to poverty. The rural population is believed to be better off now than ever before. The survey is covering the whole country and taking account of both Jewish and Arab communities; it is linked with the school-feeding scheme for Arab children in the larger towns. Children of both groups have suffered more from malnutrition than adults. The most serious dietary deficiencies are of fats and calcium, especially among Arab children. The Jewish school-feeding scheme has improved the nutrition of poor Jewish children and it is hoped that the government plan for providing school-meals for Arab children will have an equally good effect. There was less vitamin deficiency than had been expected, since vegetables and fruit in season offer a good source of many of them. Iron deficiency is commoner among the Jews than among the Arabs, who use more iron-containing plants in cooking. An educational campaign, to encourage vegetable-growing and conservative cooking, should put this right. Poor housing and high rents contribute to poverty and hence malnutrition.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

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Cardiff Royal Infirmary.
Charing Cross Hospital, London.
Edinburgh Royal Infirmary.
Glasgow Royal Cancer Hospital.
Glasgow Royal Infirmary.
Glasgow Western Infirmary.
Guy's Hospital, London.
Hull Royal Infirmary.
King's College Hospital, London
Lambeth and Hammersmith Hospitals, LCC.
Leeds General Infirmary.
Leicester Royal Infirmary.
Lincoln County Hospital and Scunthorpe Hospital.
Liverpool Radium Institute.
Liverpool Royal Infirmary.
London Hospital.
Manchester Royal Infirmary and Holt Radium Institute.
Marie Curie Hospital, Hampstead.
Middlesex Hospital.
Mount Vernon Hospital and Radium Institute, Northwood.
Newcastle, Royal Victoria Infirmary.
Newport, Royal Gwent Hospital.
Northampton General Hospital.
Norwich, Norfolk and Norwich Hospital.
Oxford, Radcliffe Infirmary.
Plymouth, Prince of Wales's Hospital.
Rochester, St. Bartholomew's Hospital.
Royal Cancer Hospital (Free), Fulham Road.
Royal Free Hospital, London.
Royal Northern Hospital, Holloway Road.
St. Bartholomew's Hospital, London.
St. George's Hospital, London.
St. Mary's Hospital, Paddington.
St. Thomas's Hospital, London.
Sheffield Radium Centre.
Southampton, Royal South Hants Hospital.
Stoke-on-Trent, North Staffordshire Royal Infirmary.
Swansea General Hospital.
Tunbridge Wells, Kent and Sussex Hospital.
University College Hospital, London.
Westminster Hospital.
Wolverhampton Royal Hospital.

AT the annual representative meeting of the British Medical Association, held in London on Sept. 21–23, Lord DAWSON was elected president. He was president in 1932, the association's centenary year.

Royal Society of Medicine

On Friday, Oct. 1, at 2.30 PM, Dr. R. J. Minnitt will deliver his presidential address to the section of anæsthetics. His subject is to be the history and progress of gas-and-air analgesia for midwifery.

Middlesex County Medical Society

The annual general meeting will be held at 5.15 PM on Tuesday, Sept. 28, at the Middlesex Guildhall, Westminster, S.W.1, when Dr. T. O. Garland will speak on changing medicine.

SIR KINGSLEY WOOD, who died suddenly on Tuesday was Minister of Health from 1935 to 1938.

CORRIGENDA: *Laboratory Control of Typhoid.*—In the report of a meeting of the fever hospital medical service group of the Society of MOHs (*Lancet*, Sept. 11, p. 323) the initials of one of the speakers, Lieut.-Colonel H. T. Findlay, were incorrectly given.

In Dr. W. N. Leak's definition of democracy (Sept. 18, p. 367) the word "only" should be omitted.

Births, Marriages and Deaths

BIRTHS

BREWERTON.—On Sept. 15, in London, the wife of Lieutenant R. E. Brewerton, RAMC—a son.
CORCORAN.—On Sept. 11, at Llandrindod Wells, the wife of Major T. M. Corcoran, RAMC—a son.
DANIEL.—On Sept. 2, at Oxford, the wife of Dr. Peter M. Daniel—a daughter.
GREGG.—On Sept. 12, in London, the wife of Surgeon Lieutenant D. McC. Gregg, RNVR—a son.
HINDLEY.—On Sept. 8, at Ruanda, Belgian Mandated Territory, the wife of Dr. G. Talbot Hindley—a son.
HULBERT.—On Sept. 16, in London, the wife of Dr. N. G. Hulbert—a daughter.
STEPHENS.—On Sept. 14, in London, the wife of Captain H. N. D. Stephens, RAMC—a daughter.

MARRIAGES

CLARKE—FRASER.—On Sept. 11, at Aberdeen, William Edward Clarke, surgeon lieutenant, to Helen Susanna Fraser, lieutenant RAMC.
COLTART—DRUITT.—On Sept. 11, at Petworth, Wilfrid Seymour Coltart, MB, of Chichester, to Jean Margaret Druitt.
GREENWOOD—MALIM.—On Sept. 11, at Saffron Walden, Kemble Greenwood, lieutenant RAMC, to Lavinia Mary Malim.

DEATHS

LEWIS.—On Sept. 14, at Pontypridd, Kingsley Wassell Lewis, MB LOND.
STIFF.—On Sept. 16, Harold Henry Stiff, MB CAMB, of Winchester, aged 70.
TREWBY.—On Sept. 10, at Rothwell, Lilian Trewby, LRCPE, sometime MO i/c Lady Dufferin Hospitals at Shikarpur and Amraoti.

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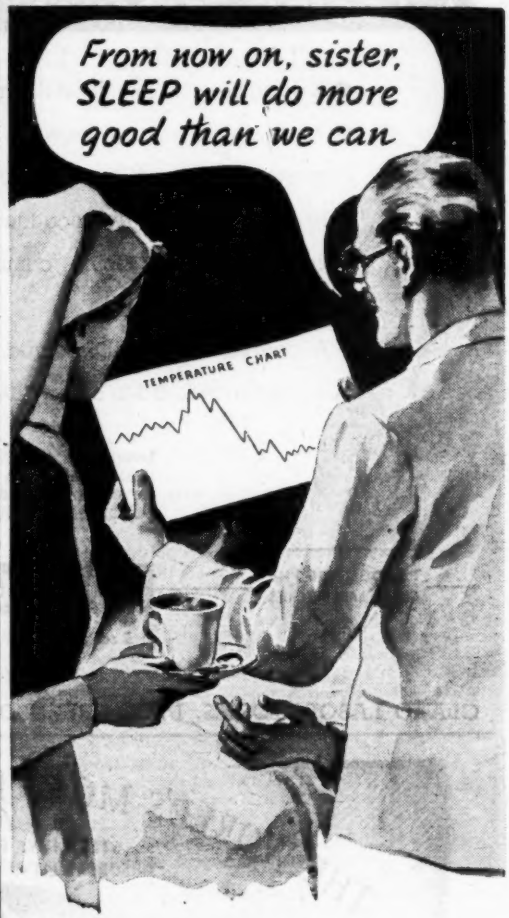

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For the reception and treatment of PRIVATE PATIENTS of both sexes of the UPPER AND MIDDLE CLASSES suffering from Mental and Nervous Disorders, Alcoholism and Drug Addiction, either voluntarily, temporarily, or under certificate. Patients are classified in separate buildings according to their mental condition. Situated in park and grounds of 400 acres. Self-supported by its own farm and gardens in which patients are encouraged to occupy themselves. Every facility for indoor and outdoor recreation. For terms, prospectus, etc., apply MEDICAL SUPERINTENDENT. *Telephone:* Ashton-in-Makerfield 7311. *Telegraphic Address:* Wootton, Ashton-in-Makerfield.

THE OLD MANOR, SALISBURY
Telephone: 3216 & 3217

A Private Hospital for the Care and Treatment of those of both sexes suffering from MENTAL DISORDERS

Extensive grounds. Detached Villas. Chapel. Garden Produce from own gardens. Terms very moderate.

CONVALESCENT HOME AT BOURNEMOUTH

standing in 12 acres of ornamental grounds, with separate villas, tennis courts, etc. Patients or Boarders may visit the Home by arrangement.

Illustrated Brochure on application to the Medical Superintendent, The Old Manor, Salisbury.

PECKHAM HOUSE, 112, Peckham Road, London, S.E.15

Telegrams: "Alleviated, London" **Telephone: Rodney 2641-2642**

A Private Mental Hospital, for Ladies and Gentlemen suffering from Nervous and Mental Illness, where the amenities of a comfortable home are combined with full investigation and every well-established modern treatment.

Terms from 3½ guineas weekly.

Illustrated Prospectus may be obtained from the Physician Superintendent.

COURT HALL, KENTON, near EXETER
FOR THE TREATMENT OF EIGHT LADIES, VOLUNTARY, TEMPORARY AND CERTIFIED PATIENTS

CLIFFDEN, TEIGNMOUTH
FOR EARLY AND CONVALESCENT CASES Recreational Therapies are held daily by skilled Leaders

The house stands high with spacious balconies and extensive views of the South Devon Coast. Beautiful garden. Own Dairy in 25 acres. Private road to beach

There is also a charming house, EBWORTHY, MANATON, DARTMOOR, situated in 20 acres, 1100 ft. up for bracing moorland air

Resident Physicians—BERTHA M. MULES, M.D., B.S. ANNE S. MULES, M.R.C.S., L.R.C.P. *Telephones*—STARCROSS 259 and TEIGNMOUTH 28

CHEADLE ROYAL CHEADLE CHESHIRE

A Registered Hospital for MENTAL DISEASES, and its Seaside Branch, GLAN-Y-DON, Colwyn Bay, N. Wales

THE object of this Hospital is to provide the most efficient means for the treatment and care of PATIENTS of BOTH SEXES suffering from MENTAL and NERVOUS DISEASES. The Hospital is governed by a Committee appointed by the Trustees of the Manchester Royal Infirmary. VOLUNTARY, TEMPORARY, AND CERTIFIED PATIENTS RECEIVED

For Terms and further information apply to the MEDICAL SUPERINTENDENT *Telephone:* GATLEY 2231

FENSTANTON at "FIVE DIAMONDS," Chalfont St. Giles, Bucks

A Private Home for the Care and Treatment of a limited number of LADIES with Mental and Nervous Disorders. Certified, Voluntary, and Temporary Patients received. Mansion with 12 acres of ground (See *Medical Directory*, p. 2441.) Apply Resident Physician. Telephone: Little Chalfont 2046. Station: Chalfont and Latimer.

HEIGHAM HALL, NORWICH

PRIVATE MENTAL HOME for Nervous and Mental illness. All forms of treatment available. Fees from 4 gns. per week upwards according to requirements. Vacancies occasionally exist at reduced fees on the recommendation of the patient's own physician.

Apply to Dr. J. A. SMALL. Telephone: Norwich 20080

CAMBERWELL HOUSE, 33, Peckham Road, London, S.E.5

Telegrams: "PSYCHOLIA, LONDON" — FOR THE TREATMENT OF MENTAL DISORDERS — Telephone: RODNEY 4242 (2 lines)

Completely detached Villas for mild cases. Voluntary Patients received. Twenty acres of grounds: own garden produce. Hard and grass tennis courts, putting greens, Recreation Hall with Badminton Court, and all indoor amusements. Occupational therapy, Calisthenics, Actino-therapy, prolonged immersion baths, shock and also modified insulin treatment. Chapel.

Senior Physician, Dr. HUBERT JAMES NORMAN, assisted by a resident Medical Staff and visiting Consultants

An Illustrated Prospectus giving fees, which are strictly moderate, may be obtained upon application to the Secretary

The Convalescent Branch is HOVE VILLA, BRIGHTON and is 200 ft. above sea-level

SPRINGFIELD HOUSE

'Phone: BEDFORD 3417. **Near BEDFORD**

For Mental Cases with or without Certificates.

Ordinary Terms: Five Guineas per week (including Separate Bedrooms for all suitable cases without extra charge).

For forms of admission, &c., apply to the Resident Physician, CEDRIC W. BOWER.

INTERVIEWS IN LONDON BY APPOINTMENT.

THE MAGHULL HOMES FOR EPILEPTICS (Inc.)

MAGHULL, Near LIVERPOOL

Open Air Occupation and Recreation for Patients, Farming, Gardening, Football, Cricket, Tennis, Bowls, etc. School recognised by Board of Education.

FEES—1st Class (men only)	from £1 per week
2nd Class (men and women)	„ 37/6 „
3rd Class (men and women) supported by—	
Public Assistance Committees	„ 27/6 „
Education Committees	„ 33/6 „
Private	„ 21/- „

For further particulars apply to—
C. EDGAR GRISEWOOD, A.C.A., 20, Exchange Street East, LIVERPOOL, 2.

MALLING PLACE, KENT

For LADIES and GENTLEMEN of Unsound Mind.

Terms moderate. Apply to Resident Medical Superintendent. Telegrams: ADAM WEST MALLING. Telephone No. 2: MALLING.

UNIVERSITY EXAMINATION POSTAL INSTITUTION

17, RED LION SQUARE, LONDON, W.C.1

Over 50 years' experience

POSTAL COACHING FOR ALL MEDICAL EXAMINATIONS

MEDICAL PROSPECTUS (36 pages)

sent gratis, along with List of Tutors, &c., on application to the Principal, 17, Red Lion Square, London, W.C.1. (Telephone: HOLborn 6318.)

Examining Surgeons:
FACTORIES ACT, 1937.

The following appointment as Examining Surgeon under the Factories Act, 1937, is vacant.

Applications should be sent to the CHIEF INSPECTOR OF FACTORIES, 28, Broadway, London, S.W.1.

District	*County*	*Latest date for receipt of application*
DARWEN ..	LANCASTER ..	30TH SEPTEMBER, 1943

The Royal Cancer Hospital (Free)
(Incorporated under Royal Charter),
Fulham-road, London, S.W.3.

Applications are invited for the post of HOUSE SURGEON (A). Salary at the rate of £200 per annum, with full residential emoluments. The appointment is subject to rules, a copy of which can be obtained from the Secretary. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for six months, to commence duty on the 1st December, 1943.

Applications to be made on a form which will be supplied by the Secretary, with copies only of not more than three recent testimonials, to be sent to the Secretary not later than the first post on Wednesday, 13th October, 1943.

CLEMENT COBBOLD, Secretary.

The Royal Cancer Hospital (Free)
(Incorporated under Royal Charter),
Fulham-road, London, S.W.3.

Applications are invited for the post of RESEARCH HISTOLOGIST (Non-medical) in the PATHOLOGICAL DEPARTMENT of the Hospital. The appointment is for twelve months in the first instance and subject to rules, a copy of which can be obtained from the Secretary. Salary £700 to £800 per annum, according to experience.

Applications to be made on a form which will be supplied by the Secretary, together with copies of three recent testimonials, should be sent to the Secretary not later than the first post on Wednesday, 13th October, 1943.

CLEMENT COBBOLD, Secretary.

London County Council.

Medical practitioners required for the undermentioned positions:—

TEMPORARY ASSISTANT MEDICAL OFFICER, Class I (B1). Salary £350 by £25 to £425 a year.

HACKNEY HOSPITAL, High-street, Homerton, E.9.	..	Casualty Officer.
ST. MARY, ISLINGTON, HOSPITAL, Highgate Hill, N.19.	..	Obstetrics and gynæcology.
FULHAM HOSPITAL, St. Dunstan's-road, Hammersmith, W.6.	..	Surgical.
ST. GILES' HOSPITAL, St. Giles'-road, Camberwell, S.E.5.	..	Medical.

Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by R.A.M.C., may apply.

TEMPORARY ASSISTANT MEDICAL OFFICER, Class II (B2). Salary £250.

BETHNAL GREEN HOSPITAL, Cambridge Heath-road, E.2.	..	Mainly medical (with anæsthetics).
ST. GEORGE-IN-THE-EAST HOSPITAL, Raine-street, Wapping, E.1.	..	Mainly medical.
QUEEN MARY'S HOSPITAL FOR CHILDREN, Carshalton, Surrey.	..	Diseases of children (surgical).
LAMBETH HOSPITAL, Brook-drive, Kennington-road, S.E.11.	..	Radiotherapy.

Infectious hospitals service.

Persons appointed to the infectious hospitals service are eligible for promotion to Class I (B1) (temporary rank) after a minimum period of six months' service.

R and W practitioners who now hold A posts may apply, when appointment will be limited to six months.

The above positions are with board, lodging, and washing. Married quarters are not available.

Application forms, obtainable from the MEDICAL OFFICER OF HEALTH (S.D.2), County Hall, S.E.1 (stamped addressed foolscap envelope necessary), returnable by 11th October, 1943.

Canvassing disqualifies.

King Edward Memorial Hospital,
Ealing, W.13.

Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant 21st October, 1943. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary at the rate of £275 p.a., with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, stating age, nationality, qualifications with dates, experience and details of previous appointments, and accompanied by copies of two recent testimonials, should be sent not later than the 7th October, 1943, to—

R. A. MICKELWRIGHT, House Governor.

Royal Northern Hospital, Holloway, N.7

Applications are invited from registered medical practitioners for the appointment of CASUALTY OFFICER AND HOUSE SURGEON (B2), vacant 11th October, 1943, for a period of six months. Salary and emoluments approximately £140 per annum, with board, residence, and laundry. R practitioners who hold A posts may apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent not later than 1st October, 1943, to—

GILBERT G. PANTER, Secretary.

Battersea General Hospital,
Battersea Park, S.W.11.

The Board of Management invite applications from duly qualified practitioners for the appointment of RADIOLOGIST on the Honorary Staff of the Hospital. The appointment in the first instance will be for the duration of the war only and the successful candidate will be required to attend for at least two sessions weekly. It is probable that the practitioner appointed will be enrolled in the Emergency Medical Service in connexion with the treatment of air-raid casualties, &c., and receive remuneration on a sessional basis.

Applications, stating age, nationality, qualifications, and experience, should be sent to the SECRETARY of the Hospital as soon as possible.

St. John's Hospital, Lewisham, S.E.13.

A TEMPORARY HONORARY ANÆSTHETIST is urgently required. Further particulars may be obtained from the SECRETARY, to whom applications should be forwarded as soon as possible.

The South London Hospital for Women,

Clapham Common, S.W.4.

The Board of Management invite applications from medical Women for the post of TEMPORARY PÆDIATRICIAN. Candidates should hold the diploma of M.R.C.P., and the successful candidate will become a Member of the Honorary Medical Staff of the Hospital.

Applications, with copies of testimonials, should be sent to the SECRETARY as soon as possible.

The Nelson Hospital, Merton, S.W.20.

Applications are invited from registered medical practitioners, Male, for the appointment of HOUSE SURGEON (B2), vacant 1st November, 1943. Salary at the rate of £250 per annum, with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be for a period of six months; otherwise may be extended.

Apply to the SECRETARY.

Borough of Walthamstow.

EDUCATION COMMITTEE.

ASSISTANT SCHOOL MEDICAL OFFICER (TEMPORARY).

Applications are invited from registered medical practitioners who are exempt from military service for the above whole-time appointment. The commencing salary is £600 per annum, rising by £25 per annum to £700 per annum, plus cost-of-living bonus at the rate of £33 17s. 10d. per annum, plus car allowance.

The person appointed may be required to assist at the Council's Day Nurseries, Child Welfare Clinics, and Maternity Hospital. Suitable experience will, therefore, be an advantage.

Applications must be made on the approved form obtainable from the undersigned, to whom it must be returned by NOON on Saturday, 16th October.

E. GWYN THOMAS, Director of Education.

Town Hall, Forest-road, Walthamstow, E.17,
16th September, 1943.

Middlesex County Council.

TUBERCULOSIS OFFICER required on unestablished staff. Salary £750 p.a. (annual increments not exceeding £50 up to maximum of £1000 p.a. may be considered), together with out-of-pocket travelling expenses. Candidates must be registered medical practitioners who have held resident appointment in a general hospital for at least six months, and have had special practical experience in the diagnosis and treatment of tuberculosis in sanatoria or otherwise. The officer appointed will be required to devote his whole time to his official duties and to work under the administrative control of the County Medical Officer of Health. The duties will include the charge of chest clinics, the general arrangement for the treatment of tuberculosis patients otherwise than in sanatoria, and such other duties as the Council may direct. The appointment, which will be subject to medical examination, will be held during the pleasure of the Council, and is terminable by three months' notice on either side.

Applications (forms not provided), stating age, qualifications, and experience, together with copies of not more than three recent testimonials, must be received by the undersigned not later than 9th October, 1943. Envelopes must be endorsed "Tuberculosis Officer."

C. W. RADCLIFFE, "B3," Clerk of the County Council.

Middlesex Guildhall, Westminster, S.W.1.

Surrey County Council.

WARREN ROAD HOSPITAL, GUILDFORD.
DEEP X-RAY THERAPY AND RADIUM CENTRE.

Applications are invited from registered medical practitioners for the appointment of ASSISTANT MEDICAL OFFICER (B1) for the above-mentioned unit (70–100 Beds) to be opened shortly at Warren Road Hospital, Guildford. Applicants should have had special experience in this type of work.

The appointment is available for the further duration of the war and is subject to one month's notice on either side; but Local Government Superannuation rights will be preserved. Salary £550 p.a., plus an allowance of £100 in lieu of residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 appointments and rejected by the R.A.M.C., may apply.

Apply to COUNTY MEDICAL OFFICER, County Hall, Kingston-on-Thames, by 6th October, 1943.

County Borough of Rotherham.

MUNICIPAL GENERAL HOSPITAL.

RESIDENT ASSISTANT MEDICAL OFFICER (A).

Applications are invited from medical practitioners, including those within three months of qualification and liable under the National Service Acts, for the above appointment. The appointment will be for a period of six months. Salary is at the rate of £200 per annum, together with full residential emoluments. A temporary bonus amounts at present to 6s. 6d. per week.

Forms of application may be obtained from the Medical Superintendent, the Municipal General Hospital, Moorgate, Rotherham, and must be returned to the undersigned, endorsed thus Monday, 6th September, 1943.

"Assistant Medical Officer," not later than the 12th October, 1943. CHAS. L. DES FORGES, Town Clerk.

Municipal Offices, Rotherham, 16th September, 1943.

County Borough of Dudley.

Applications are invited from duly qualified medical practitioners holding a degree in, or diploma of, Public Health for the post of TEMPORARY MEDICAL OFFICER OF HEALTH AND SCHOOL MEDICAL OFFICER during the period of the present emergency.

Candidates must submit with their applications full information as to their liability for military service, medical fitness, and position as regards deferment.

The person appointed will be required to perform all the duties imposed on the Medical Officer of Health under relevant Acts, Orders, and Regulations, to act as School Medical Officer, Medical Officer of the Maternity and Child Welfare Centres, Superintendent of the Blind, and such other duties as may from time to time be prescribed by the Council. The person appointed must reside within the Borough, devote his whole time to the duties of the office, and will not be allowed to engage in private practice.

The appointment will be subject to three months' notice on either side and will also be subject to the provisions of the Council's Salaries and Grading Scheme so far as applicable to temporary staff and to the resolutions of the Council in force from time to time with regard to temporary appointments.

The successful candidate will be required to undertake the duties of Surgeon to the Borough Police Force if so appointed.

The salary will be £900 per annum, rising by annual increments of £25 to £1050, in accordance with the Council's Conditions of Service. At present war bonus is payable and £100 per annum will be paid in respect of the duties as Police Surgeon.

Applications, stating age, qualifications, and experience, accompanied by copies of not more than three recent testimonials, endorsed "Medical Officer of Health," should reach the undersigned not later than 9th October, 1943.

GEO. C. V. CANT, Town Clerk.

Council House, Dudley, September, 1943.

Winchester Emergency Hospital.

1, St. Paul's Hill, WINCHESTER.

Applications are invited from registered medical practitioners, Male and Female, for the following appointments:—

RESIDENT HOUSE OFFICER (B2). R and W practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise not to exceed one year. The salary is at the rate of £350 per annum, with full residential emoluments.

ASSISTANT RESIDENT MEDICAL OFFICER (B1). Applicants should have held house appointments and had medical experience. Preference will be given to candidates holding diploma of M.R.C.P. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 and rejected by the R.A.M.C., may apply. Salary is at the rate of £550 per annum.

Apply to the COUNTY MEDICAL OFFICER, The Castle, Winchester.

Fleetwood Hospital, Fleetwood, Lancs.

Applications are invited for the position of TEMPORARY ASSISTANT SURGEON (B1) for the duration of the war. A salary of £600 per annum will be paid to the appointed candidate, who will also have the right to undertake private consulting surgical work in the district. The appointment arises through the imminent departure of the present surgeon on military service. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, stating age, qualifications, and nationality, together with copies of three recent testimonials, should be sent immediately to: JOSEPH LONGWORTH, Secretary.

Grimsby and District General Hospital.

(237 Beds.)

Applications are invited from registered practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (A), vacant 1st October, 1943. Salary is at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for six months.

Applications, giving full particulars, to the SUPERINTENDENT.

Woking Victoria Hospital. (64 Beds.)

Applications are invited from registered medical practitioners, Male and Female (British or alien), for the appointment of HOUSE SURGEON (A), vacant 22nd October, 1943. Salary at the rate of £150–£200 p.a., with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months; otherwise for a period of one year. V. CLEMENT SCOTT, Assistant Secretary.

Burton-on-Trent General Infirmary.

Applications are invited from registered medical practitioners (Male) for the post of HOUSE SURGEON (A). Salary at the rate of £200 per annum, with usual residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications, stating age, nationality, and experience, together with copies of testimonials, to be forwarded to—

E. W. THORNLEY, Superintendent and Secretary.

County Borough of Middlesbrough.

MIDDLESBROUGH GENERAL HOSPITAL.

Applications are invited from registered medical practitioners for the appointment of ASSISTANT RESIDENT MEDICAL OFFICER (B2). The salary is at the rate of £270 per annum, together with full residential emoluments. In addition to hospital duties the successful candidate may be required to undertake relief or holiday duties for other whole-time members of the Corporation Medical Staff. The General Hospital contains 353 Beds and is a training school for nurses. The appointment is subject to the rules and regulations of the Middlesbrough Corporation and the successful candidate will be required to pass satisfactorily a medical examination. R practitioners who now hold A posts may apply, when the appointment will be limited to six months; otherwise it will be for a period of twelve months.

Applications, stating age, qualifications, nationality, and particulars of present appointment and experience, accompanied by copies of three recent testimonials, to be sent to the Medical Officer of Health, Municipal Buildings, Middlesbrough, not later than Tuesday, 28th September, 1943.

PRESTON KITCHEN, Town Clerk.

Municipal Buildings, Middlesbrough, 14th September, 1943.

West Sussex County Council.

ASSISTANT COUNTY MEDICAL OFFICER AND DISTRICT MEDICAL OFFICER OF HEALTH.

Applications are invited for the temporary joint whole-time appointment of Assistant County Medical Officer for the Administrative County of West Sussex and Medical Officer of Health for the Arundel Borough and Chichester and Midhurst Rural Districts, or alternatively for the temporary part-time appointment of Medical Officer of Health for the last three named authorities.

Applicants must not be liable for military service and must be registered medical practitioners (Male or Female) with experience in public health work, and it is desirable that applicants should hold the Diploma in Public Health or its equivalent. Experience in the administration of Civil Defence Casualty Services would be an advantage.

The salary will be £800 per annum, rising by annual increments of £50 to £900 per annum for the whole-time appointment, or £550 per annum for the part-time appointment.

The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and will be temporary during the absence on military service of the present holder of the office.

Further particulars as to duties may be obtained from the undersigned, to whom applications, accompanied by copies of not more than two testimonials, should be forwarded by the 9th October, 1943.

T. C. HAYWARD,
County Hall, Chichester. Clerk of the County Council.

New Sussex Hospital for Women and CHILDREN, Windlesham-road, BRIGHTON.

Applications are invited from registered medical practitioners (Female) for the appointment of HOUSE SURGEON (B1), to commence duties as soon as possible. Salary according to experience, with minimum of £150 p.a., plus full residential emoluments. W practitioners now holding B2 posts may apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent not later than the 2nd October to—

PERCY F. SPOONER, Secretary.

Newark Town and District Hospital.

(70 Normal Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), now vacant. Salary is at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months.

B. C. DION, Secretary-Superintendent.

Royal Sheffield Infirmary and Hospital.

Applications are invited from registered medical practitioners, Male or Female, for the appointment of FIRST ASSISTANT (B1) to the SURGICAL UNIT at the Royal Infirmary. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Commencing salary is at the rate of £300 per annum, plus war bonus, non-resident. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners now holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, &c., to W. H. BOOTH, Secretary, at the Royal Hospital, Sheffield, 1.

Derbyshire Royal Infirmary, Derby.

(Voluntary Hospital.—Total Beds 416, plus 230 E.M.S.)

Applications are invited from registered medical practitioners (Male and Female) for the appointment of CASUALTY OFFICER (A), vacant 1st October. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications should be sent to—

ARTHUR TAYLOR, Superintendent and Secretary.

City of Manchester.

MONSALL HOSPITAL. (600 Beds.)

APPOINTMENT OF JUNIOR RESIDENT ASSISTANT MEDICAL OFFICER (A).

Applications are invited from registered medical practitioners, Male or Female, for the above-mentioned appointment, vacant now. The duties of the post are mainly medical.

The basic salary for the appointment is £250 per annum, with board, residence, and laundry in addition, subject to the Manchester Corporation conditions of service. A temporary cost-of-living wages addition is payable in addition to the salary stated. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months; otherwise for a period of twelve months.

Applications, stating the full name, age (giving date of birth), nationality, professional qualifications (with dates), particulars of present appointment and past hospital appointments, are to be addressed to the Medical Superintendent, Monsall Hospital, Newton Heath, Manchester, 10, and must be received by him not later than 14th October, 1943.

Canvassing in any form is prohibited.

R. H. ADCOCK, Town Clerk.

Town Hall, Manchester, 2, 16th September, 1943.

Hertfordshire County Council.

BROCKET HALL MATERNITY HOSPITAL, WELWYN, HERTS.

Applications are invited for the post of RESIDENT MEDICAL OFFICER (B1) to this Hospital of 50 Beds, staffed by the City of London Maternity Hospital. The person appointed will work under the direction of the County Obstetric Consultant, Mr. F. N. Reynolds. Salary at the rate of £200 per annum. Duties to begin 1st October, 1943, or as soon after as possible. Appointment for six months, subject to reappointment for a further period of not more than six months. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications, with two references, to County Medical Officer, County Hall, Hertford.

ELTON LONGMORE, Clerk of the County Council.

County Hall, Hertford, 14th September, 1943.

Oxford County & City Mental Hospital, LITTLEMORE, Near OXFORD.

TEMPORARY ASSISTANT MEDICAL OFFICER (B1) (Man or Woman) required immediately. Previous psychiatric experience is necessary and the person appointed will be required to help in the Out-patients' Clinics for children and adults in Oxford. Salary from £500 to £600, according to previous experience, plus cost-of-living bonus, plus full residential emoluments valued at £100 per annum. Suitably qualified R or W practitioners holding B2 appointments, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

Apply forthwith to MEDICAL SUPERINTENDENT, giving full particulars.

Oxford County & City Mental Hospital, LITTLEMORE, Near OXFORD.

LOCUM TENENS (B1), Man or Woman, required from 15th October. Salary 8 guineas per week, plus full residential emoluments.

Applications to be forwarded to the MEDICAL SUPERINTENDENT forthwith.

Berkshire Education Committee.

Applications are invited from qualified and registered dental surgeons for the temporary post of SCHOOL DENTIST. The appointment is a full-time one and the person appointed will be required to act under the instructions of the School Medical Officer. The salary is £500 to £600 per annum, according to experience.

Forms of application may be obtained from the undersigned, and applications should be returned not later than 30th September, 1943. It will be necessary for the officer appointed to have a motor-car, for which travelling expenses will be allowed on the County scale.

W. F. HERBERT, Education Secretary.

Shire Hall, Reading, 14th September, 1943.

Lincoln County Hospital.

(Voluntary Hospital—200 Beds.)

Applications are invited from registered medical practitioners for the appointment of HOUSE PHYSICIAN (A), vacant 3rd November, 1943. Salary is at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for six months.

ARTHUR MOORE, Secretary-Superintendent.

14th September, 1943.

City of Norwich.

Applications are invited for the post of TEMPORARY ASSISTANT MEDICAL OFFICER OF HEALTH AND TEMPORARY ASSISTANT SCHOOL MEDICAL OFFICER. Salary £550 per annum (plus war bonus).

For full particulars apply MEDICAL OFFICER OF HEALTH, 68, St. Giles'-street, Norwich, by whom applications for the post must be received not later than 4th October, 1943.

Southport General Infirmary.
(150 Beds.)

Applications are invited from registered medical practitioners (Male, single) for the appointment of HOUSE PHYSICIAN (A), vacant immediately. Six months' appointment. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of recent testimonials, should be addressed immediately to the SUPERINTENDENT, Infirmary, Southport.

Bury Infirmary (Lancs). (159 Beds.)

Applications are invited from registered practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (A), vacant early October. Post includes duty in midwifery and gynæcology. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months; otherwise renewable.

Applications, giving full particulars, to—
H. WILKINSON, Superintendent.

Royal Halifax Infirmary.

Applications are invited from registered medical practitioners (Male) for the appointment of HOUSE PHYSICIAN (B2), for six months commencing 1st October, 1943. Salary £175 per annum, with full residential emoluments. R practitioners who now hold A posts may apply.

Applications should be sent immediately to—
14th September, 1943. A. MIDGLEY, Secretary.

Northampton General Hospital.
(408 Beds.)

Applications are invited immediately from registered medical practitioners for the appointment of Whole-time PATHOLOGIST (B1). Salary £1000 per annum. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

Applications, with copies of three recent testimonials, should be sent to: GORDON S. STURTRIDGE, Superintendent.

The Radcliffe Infirmary, Oxford.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of a HOUSE SURGEON (A), vacant 1st November, 1943. The appointment will be for a period of six months. The salary is at the rate of £100 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply.

Applications, stating qualifications with dates, age, and nationality, with copies of three testimonials, must be sent not later than Wednesday, 6th October, 1943, to—
A. G. E. SANCTUARY, Administrator.

Swansea General and Eye Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the post of HOUSE PHYSICIAN (A), now vacant. The successful candidate will be required to reside at the Hospital Annexe (120 Beds), be responsible for the care of the patients therein, including both Medical and Post-operative Surgical cases, and attend Medical Out-patient Clinics at the Parent Hospital. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months.

Applications should be forwarded to—
O. C. HOWELLS, Secretary-Superintendent.
17th September, 1943.

Royal Sheffield Infirmary and Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of CLINICAL ASSISTANT (B1) to the FRACTURE AND ORTHOPÆDIC DEPARTMENTS at the Royal Hospital unit. Applicants should have held house appointments and have had orthopædic experience. Preference will be given to candidates holding diploma of F.R.C.S. Commencing salary is at the rate of £300 per annum, plus war bonus, non-resident. Suitably qualified R and W practitioners holding B2 posts, also R practitioners now holding B1 posts and rejected by the R.A.M.C., may apply.

Applications to W. H. BOOTH, Secretary, at the Royal Hospital, Sheffield.

Royal Infirmary, Bradford.

Applications are invited from registered medical practitioners (Male, single) for the appointment of HOUSE SURGEON (B2), vacant 1st November, including R practitioners who now hold A posts. Six months' appointment. Salary £150 per annum, with full residential emoluments. There are 345 Beds and 8 Resident Officers.

Applications, stating age, nationality, qualifications, and previous experience, with copies of three recent testimonials, should be sent immediately to— H. TRUSSON,
16th September, 1943. House Governor and Secretary.

Keighley and District Victoria Hospital,
YORKSHIRE (WEST RIDING).
(Beds: 146 Normal; 54 E.M.S.—Two Residents.)

Applications are invited from registered medical practitioners (Male and Female) for the appointment of SECOND RESIDENT MEDICAL OFFICER (A), vacant 1st October, 1943. Salary £120 per annum, with full residential emoluments. If renewed, salary £140 per annum. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months; otherwise will be for a period of six months renewable.

Applications to be received by the undersigned as soon as possible. J. YOUNG, Secretary-Superintendent.

St. Albans and Mid Herts Hospital,
Church-crescent, ST. ALBANS, HERTS. (58 Beds.)

Applications are invited from registered medical practitioners, Male or Female, for the appointment of RESIDENT MEDICAL OFFICER (B2). Salary at the rate of £200 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months.

Applications, giving full particulars, as soon as possible to Mr. P. R. BATTISON, Secretary.

Doncaster Royal Infirmary.

Applications are invited from registered medical practitioners (Male) for a SENIOR CASUALTY OFFICER (A). Surgical experience would be an advantage in order to deputise for the R.S.O. The appointment will be for six months. Salary £200 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply. This large industrial area offers excellent opportunities for gaining experience.

Applications, accompanied by not more than three testimonials, to be sent immediately to—
R. LANCASTER, Secretary-Superintendent.

Winwick Hospital, Warrington.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of JUNIOR HOUSEMAN (A), now vacant. Salary is at the rate of £120 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months, otherwise not exceeding one year.

C. R. HOYLE, Clerk and Steward.

East Suffolk and Ipswich Hospital.
(400 Beds.)

Applications are invited from registered medical practitioners, including R practitioners who now hold A posts, for the appointment of HOUSE PHYSICIAN (B2), vacant middle October. Appointment will be for a period of six months. The salary is at the rate of £175 per annum, with full residential emoluments.

ARTHUR GRIFFITHS, Secretary.
The Hospital, Ipswich, 25th September, 1943.

Royal United Hospital, Bath.

Applications are invited from registered medical practitioners (Male), including practitioners within three months of qualification and liable under the National Service Acts, when appointment will be for a period of six months, for the appointment of HOUSE SURGEON (A) (General Surgery) for 1st October, 1943. Salary £150 p.a., with board, residence, and laundry.

Applications to be sent to— J. LAWRENCE MEARS,
10th September, 1943. Secretary-Superintendent.

The Staffordshire General Infirmary,
STAFFORD.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (A), to commence duties on the 29th September. Salary £196 per annum, with board-residence. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for six months.

Applications, with full particulars as to age and qualifications, accompanied by three recent testimonials, to be forwarded to the SECRETARY.

Stafford, 17th September, 1943.

Nuneaton Emergency Hospital.
COUNTY OF WARWICK.

Applications are invited from registered practitioners (Male and Female) for the appointment of HOUSE SURGEON (A). Salary is at the rate of £200 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months; otherwise not exceeding one year.

Forms of application to be obtained from the PUBLIC ASSISTANCE OFFICER, Shire Hall, Warwick, to whom they should be returned forthwith.

14th September, 1943.

City of Manchester.

BAGULEY SANATORIUM. (421 Beds.)

APPOINTMENT OF TEMPORARY RESIDENT ASSISTANT MEDICAL OFFICER (B1).

Applications are invited from registered medical Men for the above-mentioned appointment, now vacant. Candidates should have had experience in the treatment of pulmonary tuberculosis.

Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply. The appointment will be temporary for the duration of the war.

Salary £350 per annum, rising by annual increments of £25 to £450, with board, residence, and laundry, valued at £85, in addition, subject to the Manchester Corporation conditions of service. A temporary cost-of-living wages addition is payable in addition to the salary stated.

Full information and forms of application may be obtained from the Medical Officer of Health, Hospitals Administration Section, G.P.O. Box 399, Town Hall, Manchester, 2, and applications for the post must be received by him not later than 30th September, 1943. Canvassing in any form is prohibited.

R. H. ADCOCK, Town Clerk.

Town Hall, Manchester, 2, 10th September, 1943.

West Sussex County Council.

ST. RICHARD'S (PUBLIC HEALTH) HOSPITAL, CHICHESTER. (678 Beds.)

Applications are invited from registered medical practitioners (Male and Female) for the appointment of ASSISTANT RESIDENT MEDICAL OFFICER (B2), vacant now; duties chiefly medical. Salary is at the rate of £200 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise it may be for a longer period but not exceeding one year.

Applications, stating age, qualifications with dates, nationality, with details of any experience since qualification, and accompanied by copies of any recent testimonials, should be sent to the County Medical Officer, County Hall, Chichester.

T. C. HAYWARD, Clerk of the County Council.

Brookwood Mental Hospital,

KNAPHILL, WOKING, SURREY.

Applications are invited from medical practitioners, including R and W practitioners holding B2 posts, for the post of TEMPORARY ASSISTANT MEDICAL OFFICER (B1), vacant at the above Hospital early in October. Salary £450, rising to £550 per annum, with full residential emoluments. An additional £50 per annum will be paid if in possession of the D.P.M. R practitioners holding B1 posts and rejected by the R.A.M.C. may also apply.

Applications in writing, accompanied by three recent testimonials, should be sent to the MEDICAL SUPERINTENDENT as soon as possible.

11th September, 1943.

Swansea General and Eye Hospital.

Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant 10th October. Salary is at the rate of £300, plus £100 per annum for V.D. work. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Suitably qualified R practitioners holding B2 appointments, also those holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications should be forwarded to—

O. C. HOWELLS, Secretary-Superintendent.

11th September, 1943.

Royal Berkshire Hospital, Reading.

Applications are invited from registered medical practitioners, Male and Female, for the following appointments, vacant 1st November, 1943:—

HOUSE SURGEON (A) (General and Eye).

RESIDENT MEDICAL OFFICER (A), BLAGRAVE BRANCH HOSPITAL, and ASSISTANT to the Pathologist.

Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when both appointments will be for a period of six months.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent immediately to—

H. E. RYAN, Secretary and House Governor.

Salisbury General Infirmary.

(Voluntary Hospital—225 Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), now vacant. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months.

Applications, stating age, nationality, and full particulars, together with copies of recent testimonials, to be sent at once to: JOHN WILLIAMS, Superintendent and Secretary.

Exminster Hospital, Devon.

Applications are invited from registered medical practitioners, Male and Female, for the following appointments, vacant 1st October, 1943. It is desirable that candidates should be interested in Orthopædic work, as Exminster Hospital is a Fracture A hospital and has 220 Fracture and Orthopædic beds:—

RESIDENT HOUSE SURGEON (B2). The salary is at the rate of £200 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise will be for a period of one year.

HOUSE SURGEON (A). Salary at the rate of £120 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months; otherwise will be for a period of one year.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent as soon as possible to the MEDICAL SUPERINTENDENT, Exminster Hospital, near Exeter, Devon.

Royal Manchester Children's Hospital,

PENDLEBURY.

Applications are invited from registered medical practitioners, Male and Female, including practitioners within three months of qualification and liable under the National Service Acts, for the appointment of HOUSE SURGEON (A), vacant 8th November, 1943. The appointment is for a period of six months, and the salary is at the rate of £150 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, to be sent to the undersigned not later than 2nd October, 1943.

By Order,

H. HEARDMAN, General Superintendent and Secretary.

Grimsby and District General Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the post of RESIDENT SURGICAL OFFICER (B1), vacant now. Salary at the rate of £300 p.a. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, stating age, nationality, qualifications, and copies of three recent testimonials, to the SUPERINTENDENT.

13th September, 1943.

Victoria Hospital, Accrington.

Applications are invited from registered medical practitioners, Male, for the appointment of HOUSE SURGEON (B2). Salary at the rate of £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be limited to six months.

Applications to be sent to the SECRETARY, Victoria Hospital, Accrington.

The Burslem Haywood and Tunstall

WAR MEMORIAL HOSPITAL, High-lane, TUNSTALL, STOKE-ON-TRENT.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of a HOUSE SURGEON (A), vacant immediately. Salary is at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of six months.

Applications to: O. E. LOWNDES, Secretary.

City and County of Newcastle upon TYNE.

NEWCASTLE GENERAL HOSPITAL. (900 Beds.)

APPOINTMENT OF HOUSE PHYSICIAN (A) TO CHILDREN'S DEPARTMENT, AND HOUSE SURGEONS (A) TO DEPARTMENTS OF NEUROSURGERY AND PROSTATIC SURGERY.

Applications are invited from registered medical practitioners, Male and Female, for the above appointments, shortly vacant. The appointments will be for a period of six months. Salary at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply.

Applications to be forwarded to the MEDICAL OFFICER OF HEALTH, Town Hall, Newcastle upon Tyne, 1.

Victoria Hospital, Burnley.

(169 Beds.)

Applications are invited from registered medical practitioners (Male or Female) for the appointment of HOUSE SURGEON (A), now vacant. Salary at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months; otherwise it may be extended.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of recent testimonials, should be sent to the undersigned immediately.

J. E. WHEATCROFT, Secretary.

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Royal South Hants and Southampton HOSPITAL, SOUTHAMPTON. (255 Beds.)

Applications are invited from registered medical practitioners, Male and Female, including R and W practitioners who now hold A posts, for the appointment of HOUSE PHYSICIAN (B2), vacant 1st November, 1943. The appointment will be for a period of six months. The salary is at the rate of £175 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent not later than 30th September, 1943, to: EDWARD L. WIRGMAN, House Governor and Secretary.

Coventry and Warwickshire Hospital.

Applications are invited from registered medical practitioners, Male and Female, including R and W practitioners who now hold A posts, for the appointment of HOUSE-SURGEON (B2) to the GYNÆCOLOGICAL AND OBSTETRIC DEPARTMENT, vacant 30th September next. The appointment is for six months. Salary is at the rate of £150 per annum, plus £20 per annum cost-of-living bonus, together with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent immediately to—

S. CECIL HILL, House Governor and Secretary.

Bristol Royal Hospital. Incorporating the BRISTOL ROYAL INFIRMARY and BRISTOL GENERAL HOSPITAL.

Applications are invited for the post of SURGICAL REGISTRAR (B1). Salary £400 per annum. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Candidates, who must be registered medical practitioners, should send in their applications, stating age, qualifications, and experience, accompanied by copies of three recent testimonials, to: ELLIS C. SMITH, F.C.I.S., Secretary and House Governor. Bristol Royal Infirmary.

Northampton General Hospital. (408 Beds.)

Applications are invited immediately from registered medical practitioners, Male and Female, for the following posts:

HOUSE-PHYSICIAN (A), also HOUSE SURGEON (A). Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointments will be for a period of six months.

RESIDENT ANÆSTHETIST (B2). Salary is at the rate of £200 per annum with full residential emoluments. Practitioners now holding A posts may apply, when appointment will be limited to six months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent as soon as possible to—

GORDON S. STURTRIDGE.

The Royal Hospital, Wolverhampton. (Incorporated under Royal Charter.) (310 Beds.)

Applications are invited from registered practitioners (Male and Female) for the post of RESIDENT REGISTRAR (B1) to the EAR, NOSE, AND THROAT DEPARTMENT. Candidates must have held house appointments and be competent to undertake routine clinical and operative work. Salary is at the rate of £400 p.a. or according to experience. R and W practitioners holding B2 posts, also R practitioners holding B1 posts and rejected by the R.A.M.C., may apply.

W. COCKBURN, House Governor.

Warrington Infirmary and Dispensary.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), vacant 1st November. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Apply not later than Tuesday, 12th October, to the SUPERINTENDENT AND SECRETARY, stating age, experience, and enclosing copies of three recent testimonials.

Dr. Barnardo's Homes: NATIONAL INCORPORATED ASSOCIATION.

Applications are invited from registered medical practitioners for the appointment of ASSISTANT RESIDENT MEDICAL OFFICER (B1) to the HOSPITAL (100 Beds) AND RECEPTION CENTRE, Woodford Bridge, Essex, vacant 30th September, 1943. Applicants should have held house appointments and had experience of children's diseases, and the Council of Dr. Barnardo's Homes also desires that applicants should be in sympathy with the evangelistic work of the Homes. Salary is at the rate of £350 per annum, with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Full particulars may be obtained from the CHIEF MEDICAL OFFICER, 18/26, Stepney-causeway, E.1.

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13th, and 14th editions, and Year Books wanted (£20 to £25 offered 14th edition). Advertiser pays carriage, charges, and supplies packing cases.—E. TURLL, 15, Bethia-road, Bournemouth.

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5. LANCASHIRE.—Industrial town. Panel over 3000. Receipts £4000. Appointments transferable. Nicely situated house, all conveniences. Premium, Practice and house, £7000.
6. NOTTS.—PARTNERSHIP.—Receipts £2400. Panel over 2000. Half share. Good house to rent. Premium £2400.
7. SOUTH WALES.—Receipts £2500. Panel 2500. Clubs. House to rent. Premium £4500.
8. NORTH WALES.—Receipts £1000. Panel 1000. Good house. Premium £1500.
9. ANGLESEY.—Unopposed. Receipts £700. Panel 400. Good scope. Premium £800. Excellent house, all modern convenience. Near sea. £900.
10. LIVERPOOL.—Panel 1800. Industrial. Scope. Income £2000. 1½ years' purchase. Good house to rent.
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